AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

APRIL 15, 1956

In This Issue

A CHILTON PUBLICATION

Exit...

ONE SITTING DUCK

A message of importance to all contestants in the battle against high production costs

PIT A World War II plane against a modern jet fighter and what have you got? One sitting duck! Why? Not because the "prop job" got any *slower*. But because the modern supersonic jet got so much *faster!*

So it is with machine tools. The machine you bought ten years ago may still be working just as good as ever. Yet by today's standards of production speed and economy, that same machine can be *losing money* — perhaps more than a new machine would cost.

This "creeping obsolescence" can often go unnoticed—particularly on small-lot and tool room machines that are not geared directly to a fast-moving automated production line. So take a good look at the old universal Bore-Matics, Rotary Surface Grinders, Tool-Room and Plain Internals in your shop. Check their production and maintenance costs. The results may surprise you.

Your Heald sales engineer will be glad to help you evaluate these machines, fairly and squarely — to show you whether they are earning money for you, or losing it. If you find that you're *paying* for a new machine, you might as well *have* it!

IT PAYS TO COME TO HEALD

HEALD

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

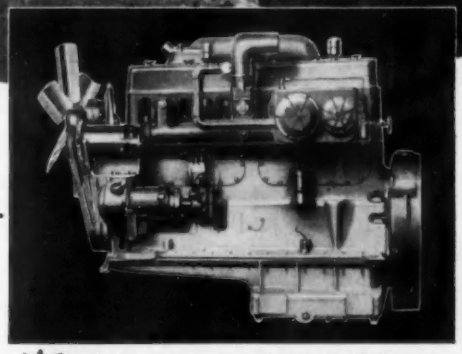
Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

This fast traveling truck, powered with a Waukesha Super Duty Six, moves more material, most economically, in mining service.

WAUKESHA

for fast, heavy hauls



Powering the truck — Model WAKR Butane Super Duty Six—6¼-in. bore x 6½-in. stroke, 1197 cu. in. displacement, 290 horsepower at 1800 rpm.

1197 cubic inch Super Duty ENGINES

all with counterbalanced crankshafts

WAKR Butane | **WAKDB** Normal Diesel | **WAKDBS** Turbodiesel

up to 352 maximum hp

This truck is one of sixteen in a mining company's fleet. Hauling 22-ton average payloads—up 6 to 8 per cent grades—off-the-highway most of the time—and they work a twenty-hour day. Only after 7000 hours or more of this heavy hauling mine service are the engines overhauled—a good average.

Let's look at this truck's power. It has a torque converter—automatic transmission combination—and the engine is one of the Waukesha 1197 cubic inch Super Duty Sixes. This is Model WAKR, burning butane. Built like the Super Duty Diesels in this WAK Series, except for cylinder heads and injection equipment.

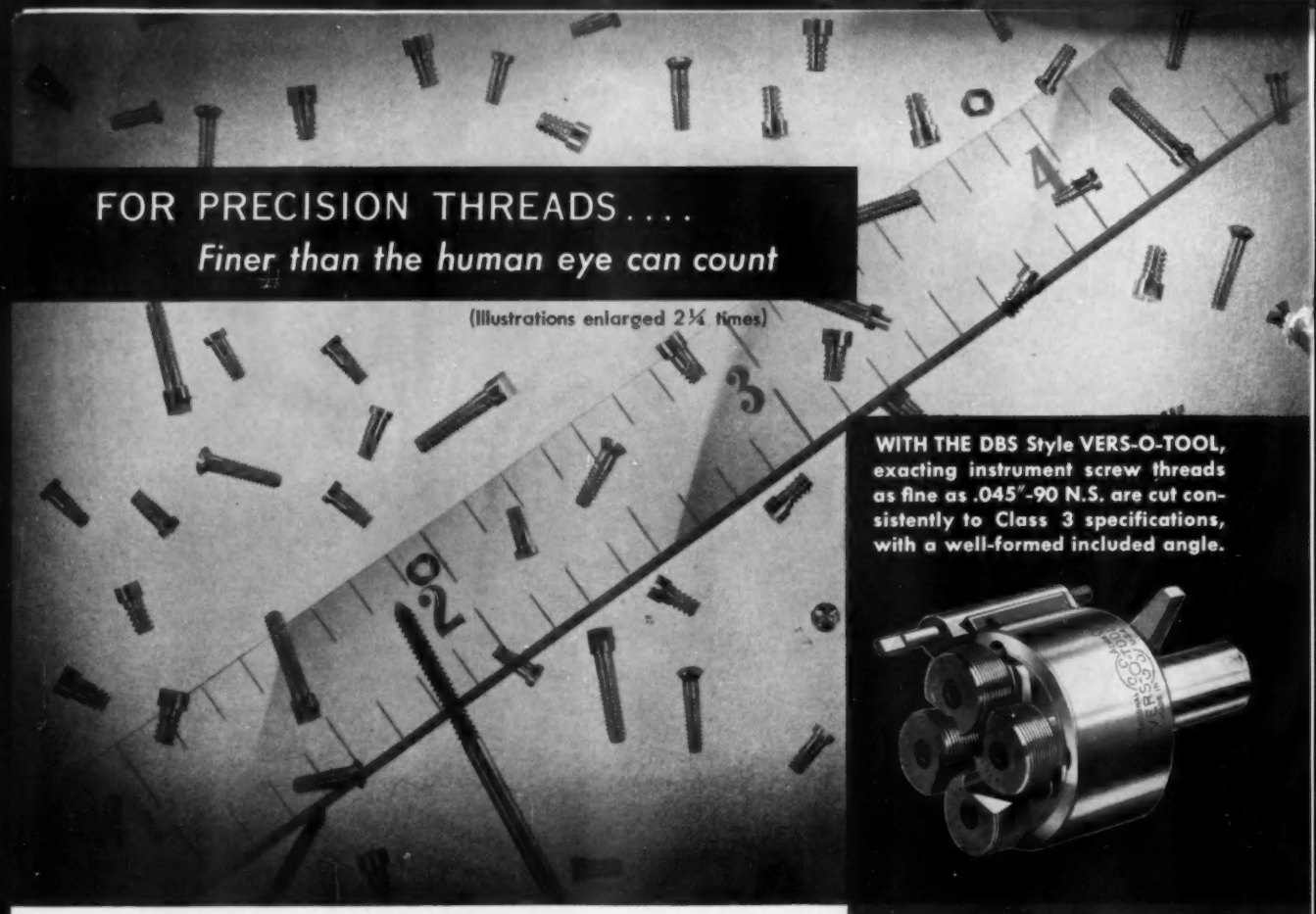
Write for descriptive bulletins

308

50th ANNIVERSARY Waukesha MOTOR 1906-1956

WAUKESHA MOTOR COMPANY • WAUKESHA, WIS.

NEW YORK • TULSA • LOS ANGELES



FOR PRECISION THREADS....

Finer than the human eye can count

(Illustrations enlarged 2¼ times)

WITH THE DBS Style VERS-O-TOOL, exacting instrument screw threads as fine as .045"-90 N.S. are cut consistently to Class 3 specifications, with a well-formed included angle.

IF YOU CUT THREADS, TURN, OR FORM FROM THE END — Namco VERS-O-TOOL System gives you greater cost-reducing flexibility.

This standard VERS-O-TOOL head

cuts 'em by the thousands—exactly to specifications

Each threading job, whether it's tiny precision instrument parts, or huge oil field pipe lines, has its own special requirements. Maybe it's machinability, thread form or size . . . or it may be tolerances or fussy finishes.

In supplying and servicing National Acme Vers-o-tool heads for thousands of such threading jobs, our engineers have become familiar with all those requirements.

And it's a pretty good bet that in so doing, they have accumulated the experience which will give you the most accurate threads, with the least trouble—and at the lowest cost per piece.

You name the job. Vers-o-tool has the cost-cutting answer.

SEND FOR BULLETIN DT-52. Or, better yet, ask for our recommendations.

It's this simple —

- *Take a standard Vers-o-tool (the self-opening die head—you don't have to back it off the threads).*
- *For threading, use National Acme ground thread chasers (for greatest economy use the circular type for long runs; the adjustable blade type for short runs).*
- *Convert to any other end turning or forming operation by changing only the cutters and blocks.*
- *Use Namco micrometer gage to check and set chasers or cutters during resharpening. No time-wasting trial cuts required.*
- *Standard Vers-o-tools are made in revolving Style DR and non-revolving Style DS for diameters .056" to 6½"; Style DBS for BSA and Brown & Sharpe automatics.*

National Acme

THE NATIONAL ACME COMPANY, 173 EAST 131ST STREET, CLEVELAND 8, OHIO

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

APRIL 15, 1956 — VOL. 114, NO. 8

FEATURES

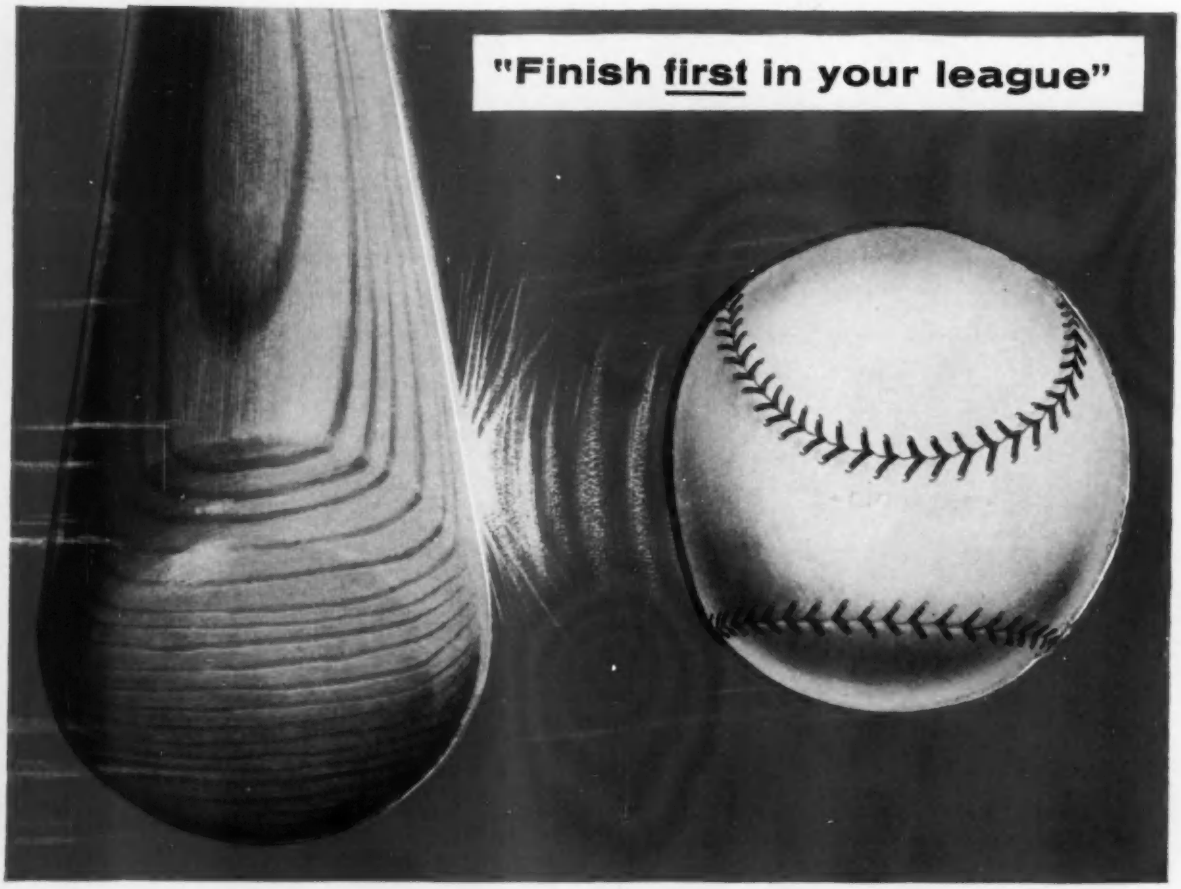
NEWS PREVIEWS

DEPARTMENTS

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, United States Possessions, 1 year $2.00, 2 years $3.00. Canadian and Foreign, 1 year $5.00, 2 years $8.00; single copies, 25 cents, except Statistical Issue (Mar. 15th), $1.00



...with J&L COLD FINISHED LEADED STEELS

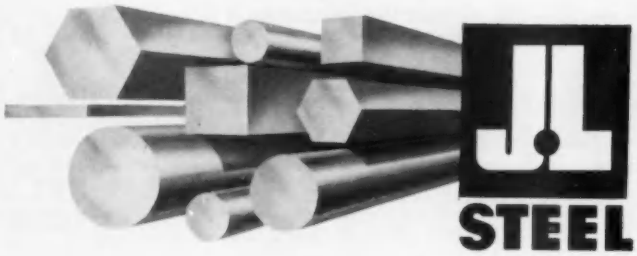
These modern, superior J&L Leaded free-machining cold finished steels are meeting with outstanding acceptance in machine shops everywhere. They are a star member of the complete line of premium quality, free-cutting cold finished bar steels produced over the years by J&L specialists. Thus, we can recommend the right type to help solve your machining problems.

Available in *both Bessemer and Open-Hearth grades*, J&L Leaded steels offer:

- **SUPERB MACHINABILITY**—because they enable you to use optimum cutting speeds, to secure longer tool life and to produce superior surface finishes.
- **GREATER UNIFORMITY**—because they are completely J&L-produced from the basic raw materials to guarantee optimum uniformity so necessary for today's high-speed machining operations.
- **HIGHEST QUALITY**—because they must meet the rigid quality standards developed by J&L through years of leadership in the development and production of free-cutting steels.

Adequate stocks of all J&L cold finished free-machining steels are available in important industrial centers. Phone the nearest J&L District Office or your Distributor for prompt and efficient service.

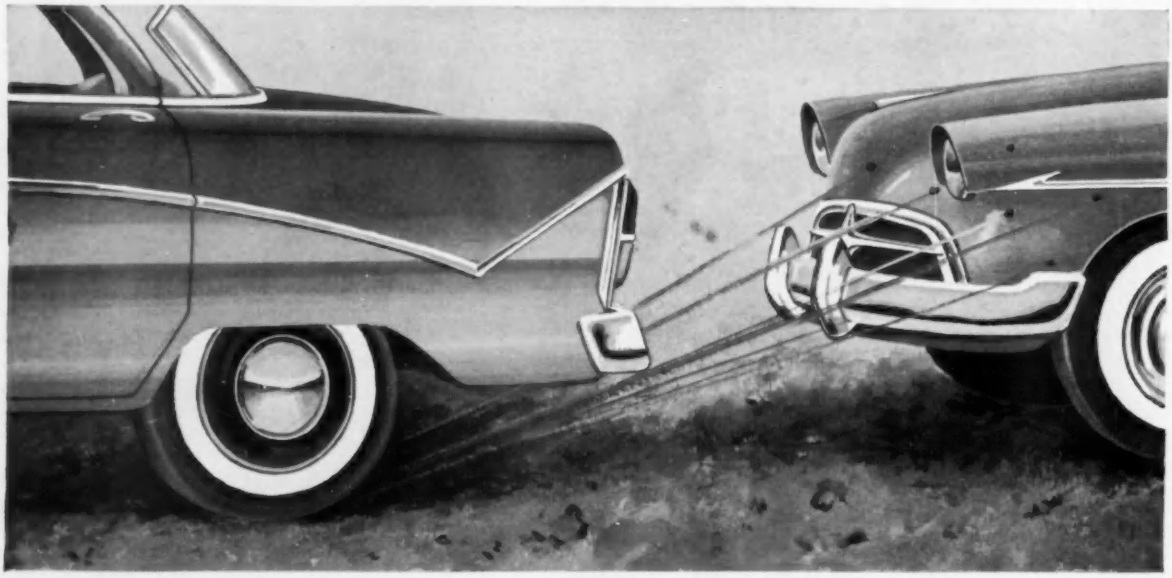
Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

COLD FINISHING PLANTS AT PITTSBURGH, PA., AND HAMMOND, IND.

NOW—Startling impact and corrosion resistance under organic finishes...



with this NEW zinc-manganese phosphate coating—

PENNSALT FOSBOND 64!

Give rough-used painted metal surfaces the utmost protection from impact and corrosion—give them new FOSBOND® 64 zinc-manganese phosphate protection! Glossy organic finishes on steel surfaces such as auto bodies, appliances, and furniture stand up far longer under sharp, paint-chipping impacts when they've been locked on with Fosbond 64. Steel surfaces treated with Fosbond 64 resist corrosion from severe weathering far longer than steel treated with other phosphate coatings.

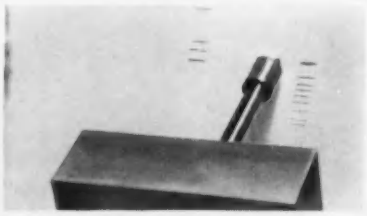
The outstanding protection offered by Fosbond 64 is the result of completely new thinking in phosphate coating. Fosbond 64 offers you a *new high* in reliability.

GET THE WHOLE STORY. If your product must withstand severe impact *and* severe corrosion, learn how Fosbond 64 protects against *both!* Call your Pennsalt man, or write Metal Processing Department 299, Pennsylvania Salt Manufacturing Company. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: Woolsey Bldg., 2168 Shattuck Ave., Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

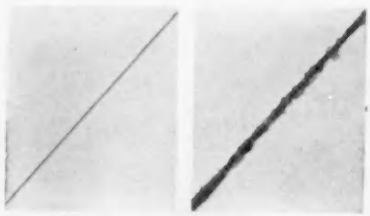
Chemical Progress Week April 23-28

Pennsalt Chemicals

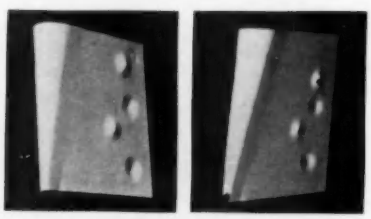
Metal Cleaners • Phosphate Coatings • Cold-Working Lubricants



CHIP-RESISTANCE. Test panels pre-coated with Fosbond 64 take twice as many inch-pounds of impact (on standard DuPont Chip Tester) as finish applied over conventional zinc-phosphate coating.



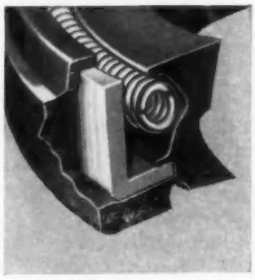
SALT-SPRAY TEST. After 300-hour exposure, Fosbond 64 (left) allows no creep of corrosion under paint, while conventional zinc-phosphate coating (right) shows ⅛" undermining of paint film.



IMPACT TEST. Paint applied over Fosbond 64 (left) doesn't fracture on direct and reverse impact and bending over conical mandrel, while paint over normal zinc-phosphate coating (right) fractures from same treatment.

A BETTER START FOR YOUR FINISH

Heavy-duty dual sealing at single seal cost



Type K4 with Victoprene on O.D.

For installations requiring sealing element on outer periphery and outside face, K4 seals are so designed. Otherwise, construction is identical with K6 seal as above.

The K6 offers you highly developed double lip design with integral metal O.D. case and supplementary edge sealing. Thoroughly proven on heavy-duty applications, this construction is the modern replacement for costlier compound element seals and multiple seal installations.

The K6's efficient dual function of sealing in lubricant and sealing out foreign matter permits maximum compactness in seal housing.

The sealing element is oil-, age- and heat-resisting Victoprene synthetic rubber. Exclusive Victor process of mechanical and chemical bonding combines the element and metal case into a permanent single-unit structure.

Other K6 Features

The supplementary Victoprene edge compresses against shoulder on base to assure positive O.D. seal with metal to metal O.D. press fit.

Valley between sealing lips retains initial lubricant for minimum friction and longer sealing life.

Unitary construction for minimum width requirements. Available in minimum width of ¼ inch, and for shaft diameters up to 7 inches.

Available with or without garter spring on primary sealing lip.

External or secondary sealing lip, molded with initial light interference, permits satisfactory installation. Upon installation, the primary sealing lip displaces to increase sealing efficiency of secondary member through flex action.

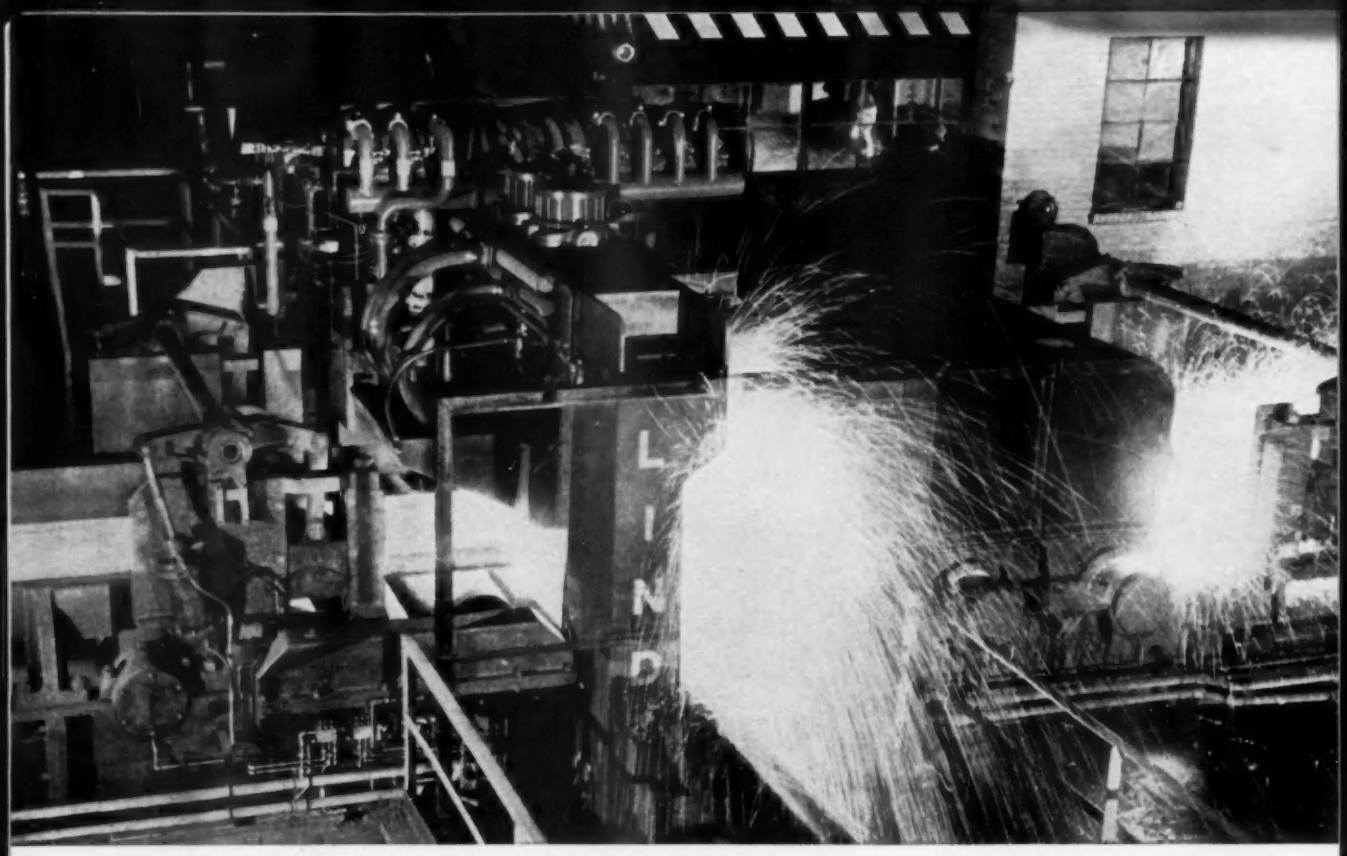
You Can Save with This Seal

The K6 assures finest dual sealing with single seal economy. Get complete specifications and recommendations through your Victor Field Engineer, or by writing: Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill. *In Canada:* Victor Mfg. & Gasket Co. of Canada Ltd., St. Thomas, Ont.

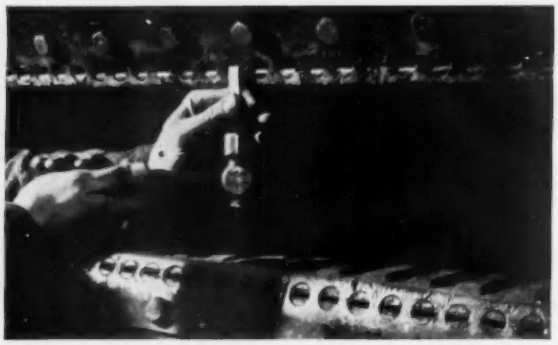
VICTOR

Sealing Products Exclusively

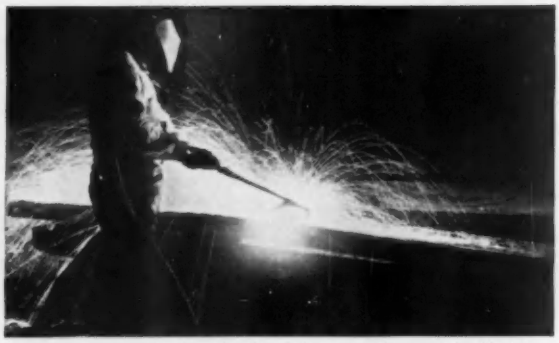
OIL SEALS • GASKETS • PACKINGS



How Great Lakes Steel *planes* quality



144 BURNER JETS automatically plane both top and bottom of slabs to remove surface cracks and impurities.



HAND SCARFER double checks slabs to make certain that any flaws extending below surface are also removed.

Just a dramatic picture of a steel mill in action? Far from it! These sizzling-hot sparks tell another very important story about the special care that goes into making steel at Great Lakes.

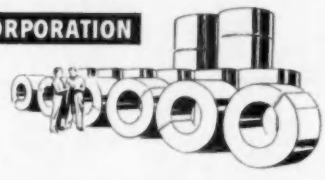
They're bouncing out from beneath the burner jets of the automatic hot scarfing machine. Scarfing? Just as you plane wood to get a smooth, flawless surface, so does the scarfer automatically burn away the top and bottom "skin" from each slab of steel. Then, jets of water sweep the slab clean.

The end result: you get a higher quality, deep-drawing sheet with an inherently flaw-free surface. That's one more important reason why you should call Great Lakes about your steel needs. And remember, Great Lakes customers get what they call for.

GREAT LAKES STEEL CORPORATION

Ecorse, Detroit 29, Michigan • A Unit of

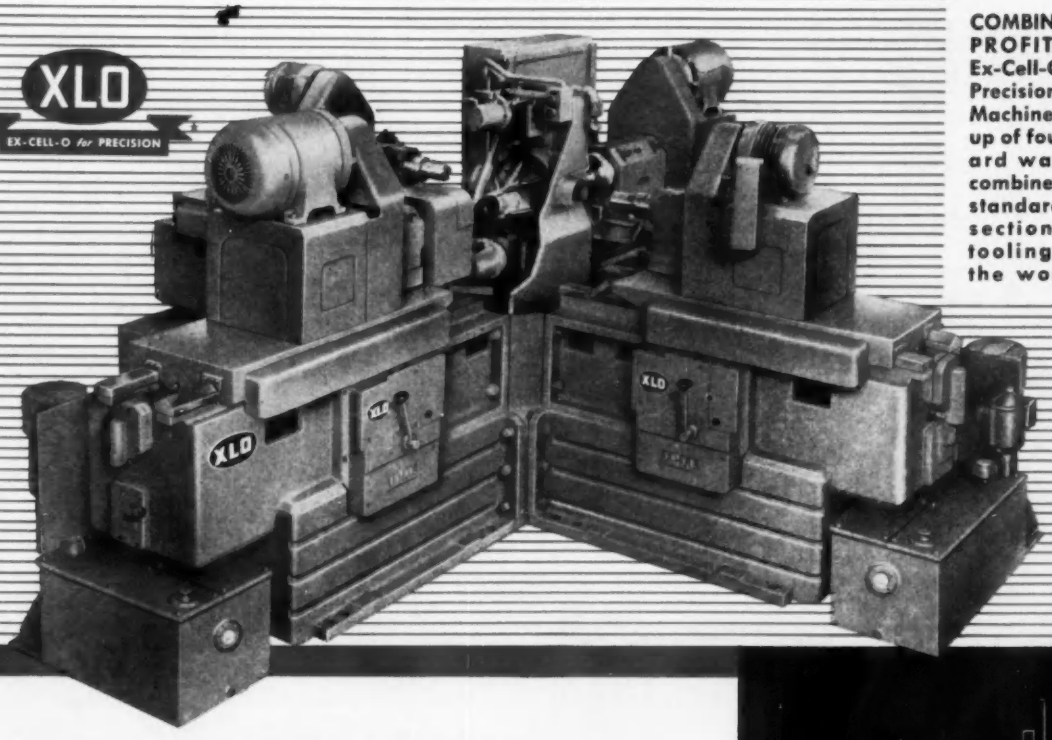
NATIONAL STEEL CORPORATION



District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.

XLO

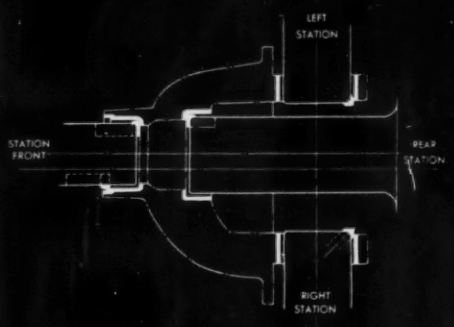
EX-CELL-O *for* PRECISION



COMBINED FOR PROFITS—this Ex-Cell-O 4-Way Precision Boring Machine is made up of four standard way units combined with a standard center section, with tooling to suit the work.

4 HOLES, 90° APART, BORED SIMULTANEOUSLY

BY EX-CELL-O 4-WAY MACHINE



SIMULTANEOUS MACHINING of four holes assures a 90° relationship between bearing bores and pinion bores.

This differential carrier assembly requires the boring of accurate holes at right angles to one another. Bore diameters are held as close as .0005". Shoulders must be square with bores. Bearing bores must be square with pinion bores.

Here was an opportunity to combine operations by using an Ex-Cell-O 4-Way Precision Boring Machine, with these profitable results:

FASTER PRODUCTION—machine works simultaneously from four directions.

PRECISION—accurate bores, holding the 90° relationship, are produced by precision spindles, smooth, hydraulically operated slides, and accurate location of the way units.

RELOCATION ERRORS ELIMINATED—since the part is located and clamped only once, there can be no errors caused by relocating and reclamping.

Is there an opportunity to cut costs and combine operations in your product? These way-type precision boring machines, special machines composed of standard units, also are used in automated production lines. They can be placed side by side and connected with transfer type fixtures to form transfer machines, or they can be combined in a transfer machine at those stations where precision boring and similar operations are required.

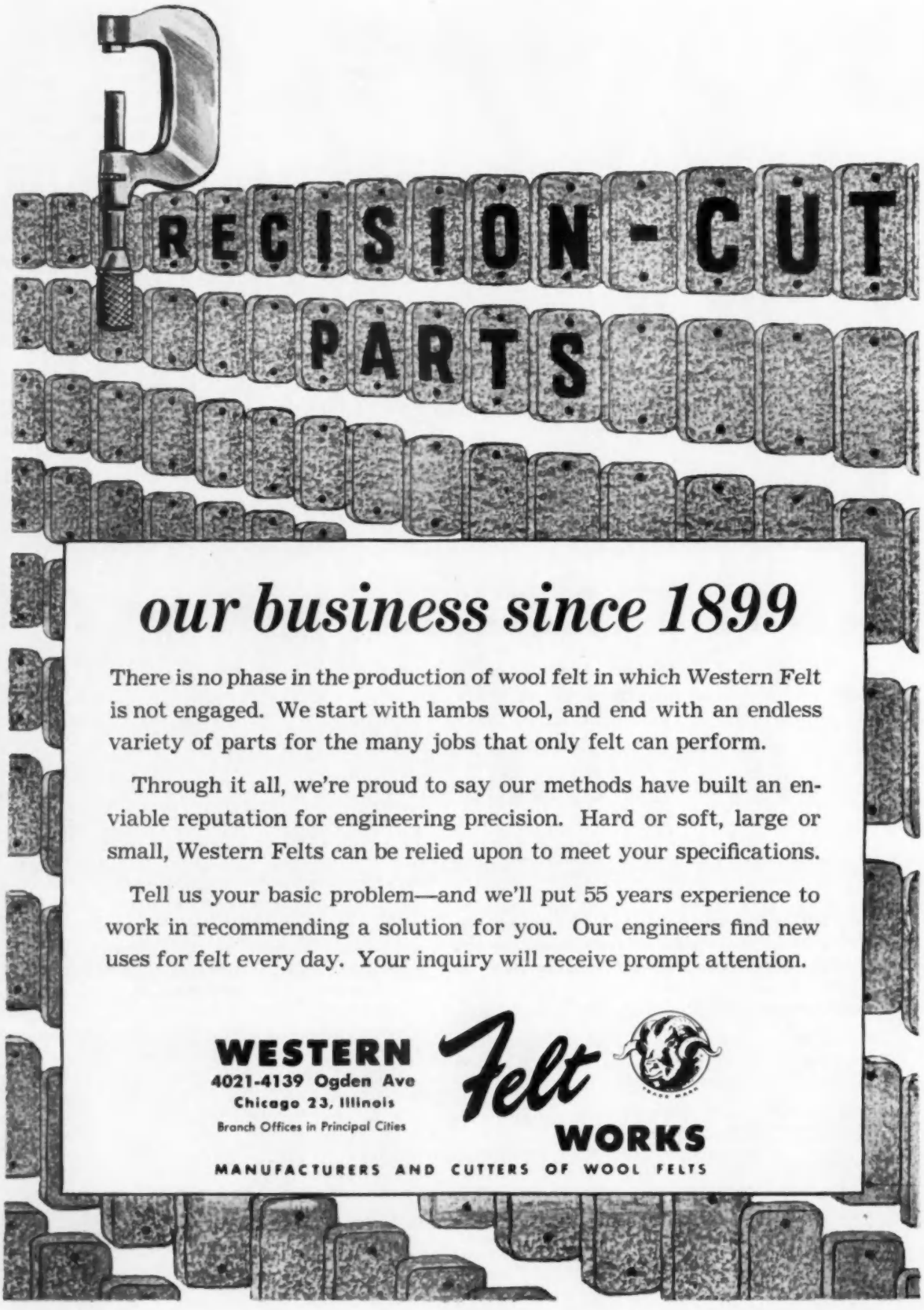
Ask your Ex-Cell-O Representative about all the other advantages of Ex-Cell-O Way Machines, or write for Bulletin.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-3



our business since 1899

There is no phase in the production of wool felt in which Western Felt is not engaged. We start with lambs wool, and end with an endless variety of parts for the many jobs that only felt can perform.

Through it all, we're proud to say our methods have built an enviable reputation for engineering precision. Hard or soft, large or small, Western Felts can be relied upon to meet your specifications.

Tell us your basic problem—and we'll put 55 years experience to work in recommending a solution for you. Our engineers find new uses for felt every day. Your inquiry will receive prompt attention.

WESTERN
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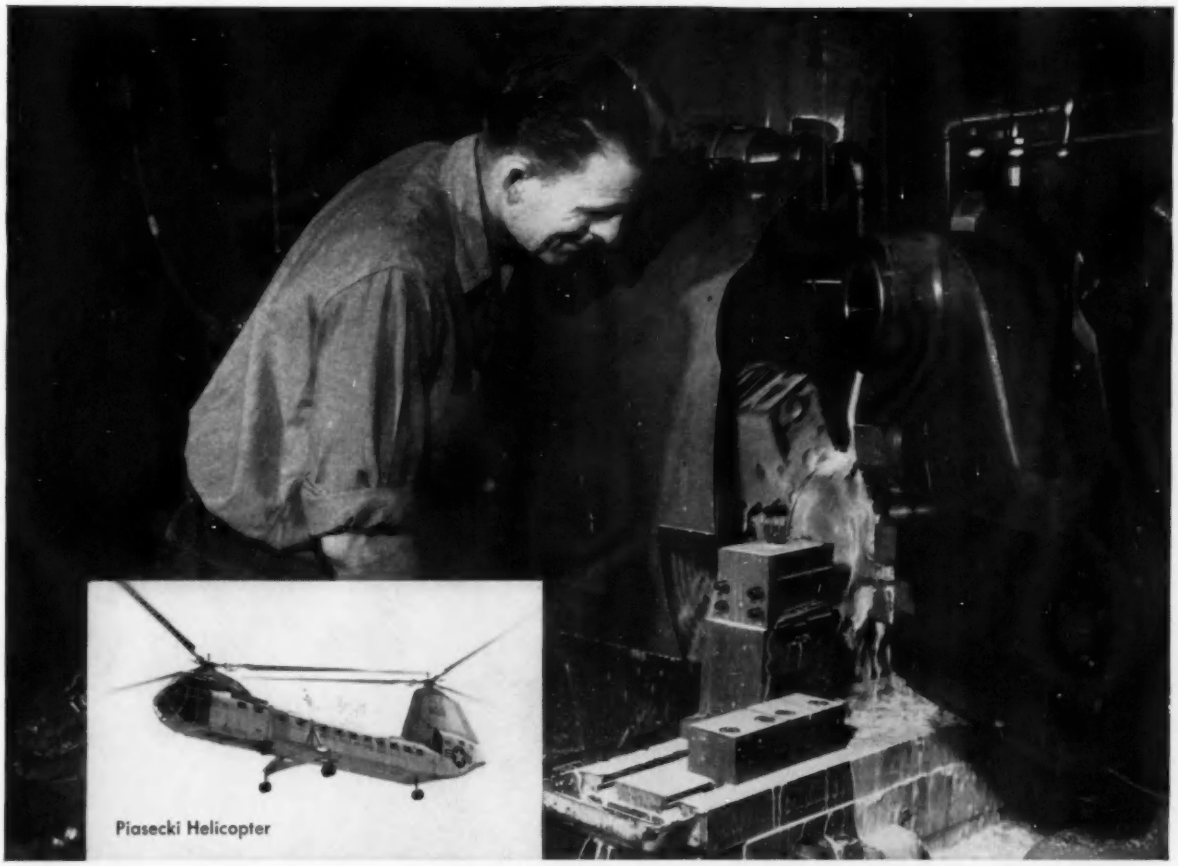
Felt **WORKS**

MANUFACTURERS AND CUTTERS OF WOOL FELTS



Sun's Heavy Duty Emulsifying Cutting Oil excels on high-alloy aircraft steels

S.E.C.O. Heavy Duty handles all machining jobs requiring an emulsifying cutting oil. Piasecki Helicopter's large job shop at Morton, Pa., found this out three years ago when S.E.C.O. HD* replaced two expensive heavy-duty soluble oils in machining fan hubs.

Extremely versatile and moderately priced, S.E.C.O. HD has been doing an exceptional job in cutting a variety of high-alloy aircraft steels for Piasecki.

For more information about S.E.C.O. HD, see your Sun representative. Or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-4.

WRITE FOR FREE TECHNICAL INFORMATION

- *Cutting and Grinding Facts*
- *Disposal of Waste Emulsions*
- *New Improved S.E.C.O.*
- *S.E.C.O.—Mixing Instructions*
- *S.E.C.O. HD*

SUNOCO®

*TRADE-MARK

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

Diamond ring for a diesel

ELIMINATES INJECTION NOZZLE LEAKS

Crankcase dilution can be a big headache. But not for one of the leading Diesel manufacturers. They knew that the right injection nozzle seal would cure a major cause . . . and came to C/R Sirvene engineers for help. C/R manufactured this Sirvene (synthetic rubber) part to extremely critical dimensions and physical properties to match the equally precise dimensions of the assembly. Result: no more leakage. When you need a pliable mechanical part compounded to meet critical specifications of heat, pressure, abrasion resistance and molded to the most exacting tolerances, you need C/R Sirvene. C/R Sirvene engineers will gladly cooperate with you in all phases of your sealing problem . . . from design, compounding of the correct oil-resistant elastomers, through laboratory-like control of production quantities. Write for your copy of the new booklet, "Sirvene."

CHICAGO RAWHIDE MANUFACTURING COMPANY
1205 Elston Avenue, Chicago 22, Illinois

Offices in 55 principal cities • See your telephone book

In Canada: Manufactured and Distributed by
Super Oil Seal Mfg. Co., Ltd., Hamilton, Ontario

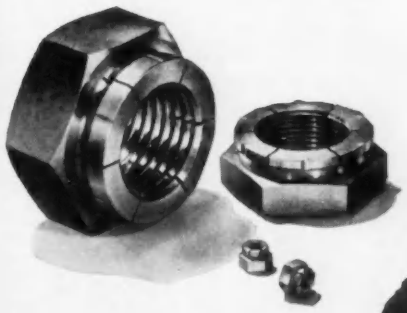
Export Sales: Geon International Corp., Great Neck, New York

OIL SEAL C/R DIVISION

CHICAGO RAWHIDE

Other C/R Products
C/R Shaft and End Face Seals • Sirvis-Conpor mechanical leather cups, packings, boots • C/R Non-metallic Gears

PHILADELPHIA TRANSPORTATION COMPANY, Philadelphia, Pa., uses FLEXLOC Self-Locking Nuts on the rear axle flanges of its buses. This carrier has found that FLEXLOCs eliminate sheared studs, reduce maintenance, save time and money.



How FLEXLOC locknuts work

FLEXLOCs lock and stay put on threaded member regardless of t vibration encountered. Here's ho they work. The slotted top or lockin section is divided into six equal, flexible segments, closed in to make the inside diameter of the nut smaller than that of the companion bolt. When the FLEXLOC is applied, these are expanded by the bolt. The spring tension of the resilient segments locks the nut securely at any desired position on the bolt once the locking threads are fully engaged.

FLEXLOCs can be used over and over again. When expanded by the bolt, the locking section remains within the elastic limit of the metal. This permits the locking segments to return to their normal position, ready for reapplication to the bolt.

FLEXLOCs are one piece, all metal—nothing to assemble, come apart, lose or forget. They can be delivered in any quantity in a wide range of sizes. Stocks are carried by industrial distributors everywhere. Write for literature and samples. SPS, Jenkintown 53, Pa.

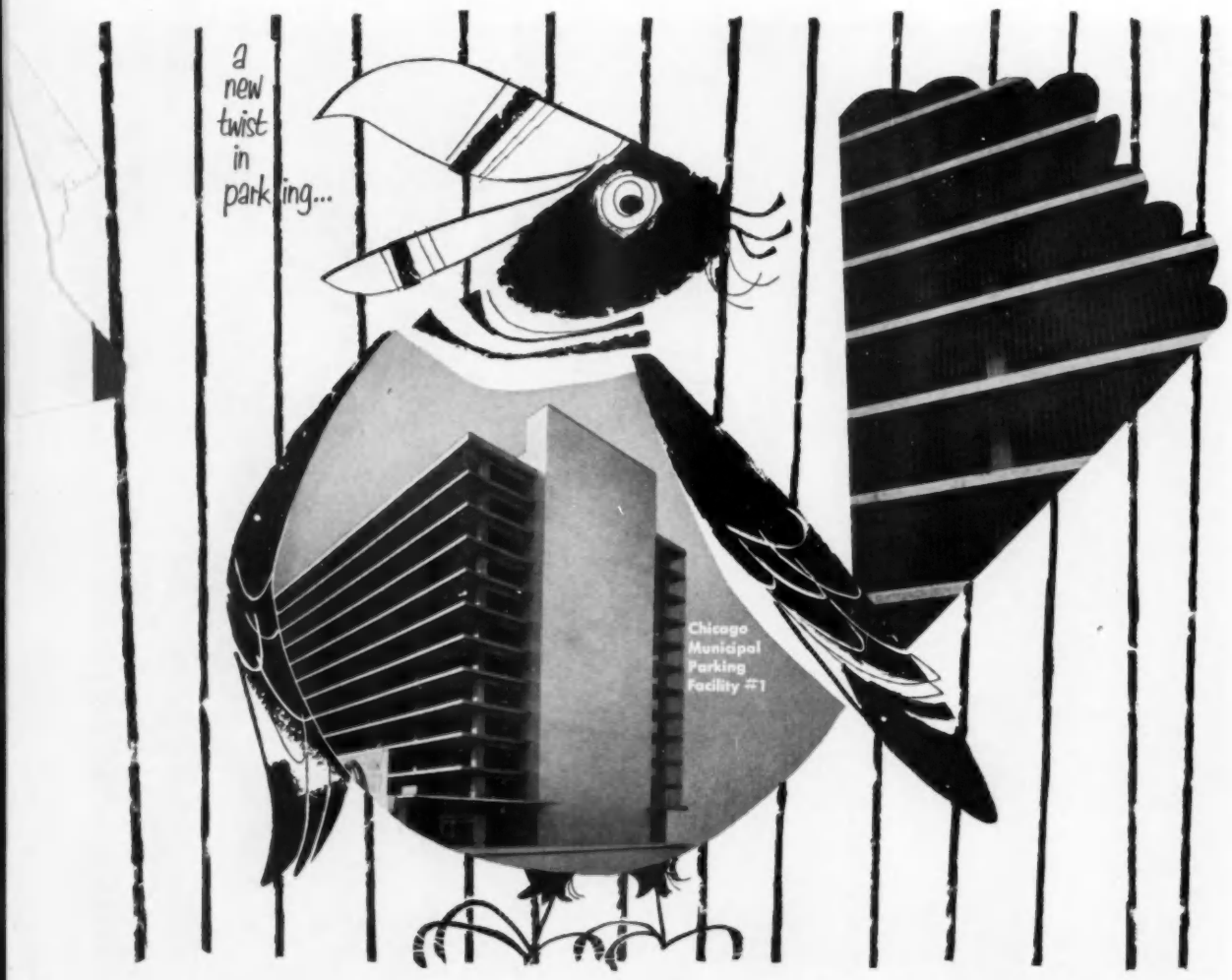
FLEXLOC®

LOCKNUT DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA



12 STORY "BIRD CAGE" SEALED IN SAFETY WITH **STAINLESS STEEL STRAND!**

Want more proof of stainless steel's versatility? Here it is: this time as a protective cable barrier in the "Bird Cage" garage – Chicago's new twist in solving parking problems.

The ⅜ in. stainless steel strand is strong enough to withstand the impact of a car traveling 40 mph! The cable assembly does away with old methods of masonry and solid wall construction, too. And what a difference that makes in construction costs!

No wonder more and more architects and designers are looking to stainless steel. It can solve both structural and decorative requirements in a single member. For economy and practicality, no other metal can match it.

Put stainless' beauty, strength and corrosion resistance to work for you, too. Your supplier has full particulars on how it can be engineered profitably in your product.

a new twist in design... The sweep and flow of modern auto design is made possible through the beauty of stainless steel—corrosion resistance makes it ideal for interior and exterior decorative parts.

The finest stainless steels are made with Vancoram ferro alloys.

Our 50 Years of Progress

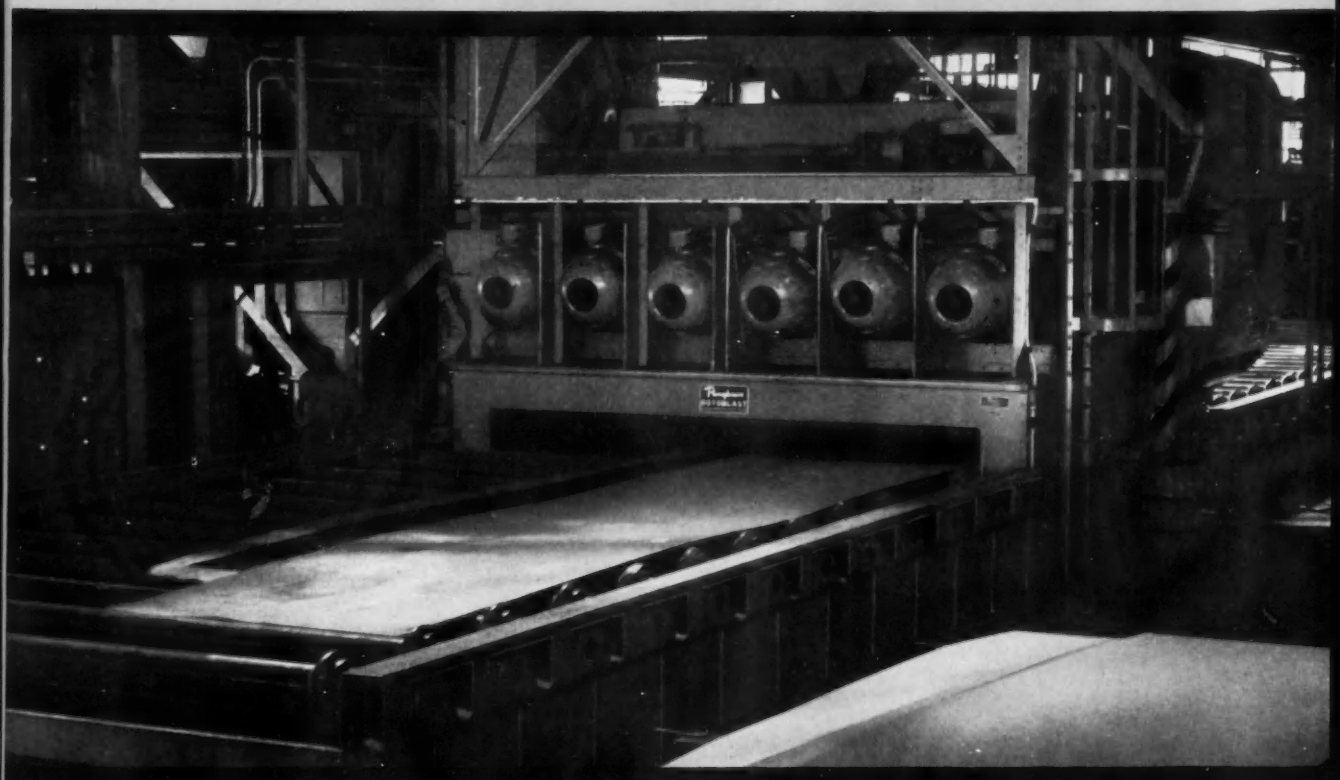
VANADIUM CORPORATION OF AMERICA

420 Lexington Avenue, New York 17, N. Y. Pittsburgh • Chicago • Cleveland • Detroit

Producers of alloys, metals and chemicals

VANCORAM

Descale steel sheets, plates, coils



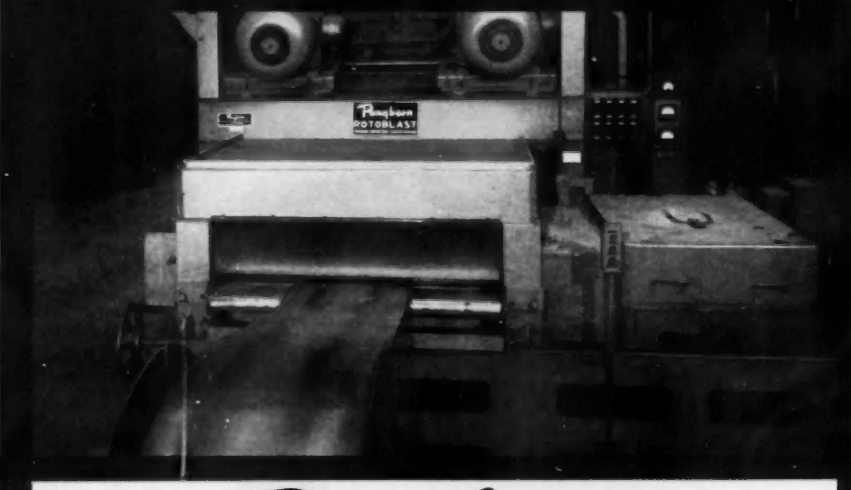
No more scale breaking or pickling! No more acid disposal problems! Pangborn Rotoblast Descaling Machines descale steel sheets, plates and coils, and they operate at big savings over pickling costs!

How? They work quickly. They clean thoroughly. They're a one-man operation. Unlike acid baths, they can be located near your production, cutting handling costs. And they save floor space, require much less room than vats. Available in a variety of models, Pangborn Rotoblast Descaling Machines handle steel sheets, plates and coils of any thickness, width and length. If you want to cut descaling costs to the bone, investigate Pangborn Descaling Machines!

For complete information, send for Bulletin 224. Write: PANGBORN CORPORATION, 3900 Pangborn Blvd., Hagerstown, Maryland.

*U. S. Pat. #2184926 (other patents pending)

at *less than half the cost*



with Pangborn Rotoblast® Descaling Machines!

Pangborn

BLAST CLEANS CHEAPER


Rotoblast Blastmaster® & Continuous-Flo Barrel


Rotoblast Tables & Table-Rooms


Special Blast Rooms & Cabinets


Pangborn Dust Control Equipment


Malleabrasive® Shot & Grit

Kearney & Trecker offers you standard

Illustrated here are several standard units which Kearney & Trecker incorporates in automatic production machines that perform a combination or series of drilling, milling, boring and tapping operations to exacting accuracies.

Kearney & Trecker combines these standard design units with a minimum of special engineering to keep production machine costs at a minimum. What's more, you get increased production at lower cost and higher efficiency. Such utilization of standard units provides the economies you want, from job-proven designs with minimum of capital investment.

Standard Feed Slide Unit — One of the most important developments, the Model B Feed Slide provides hydraulic feed for milling, boring or drilling heads. Available in four sizes (determined by width of ways), and each size in four different length cylinder strokes. A variety of feed cycles is possible — single, fine and coarse, single skip, double skip and feed return. (Data Sheet No. 1019a.)

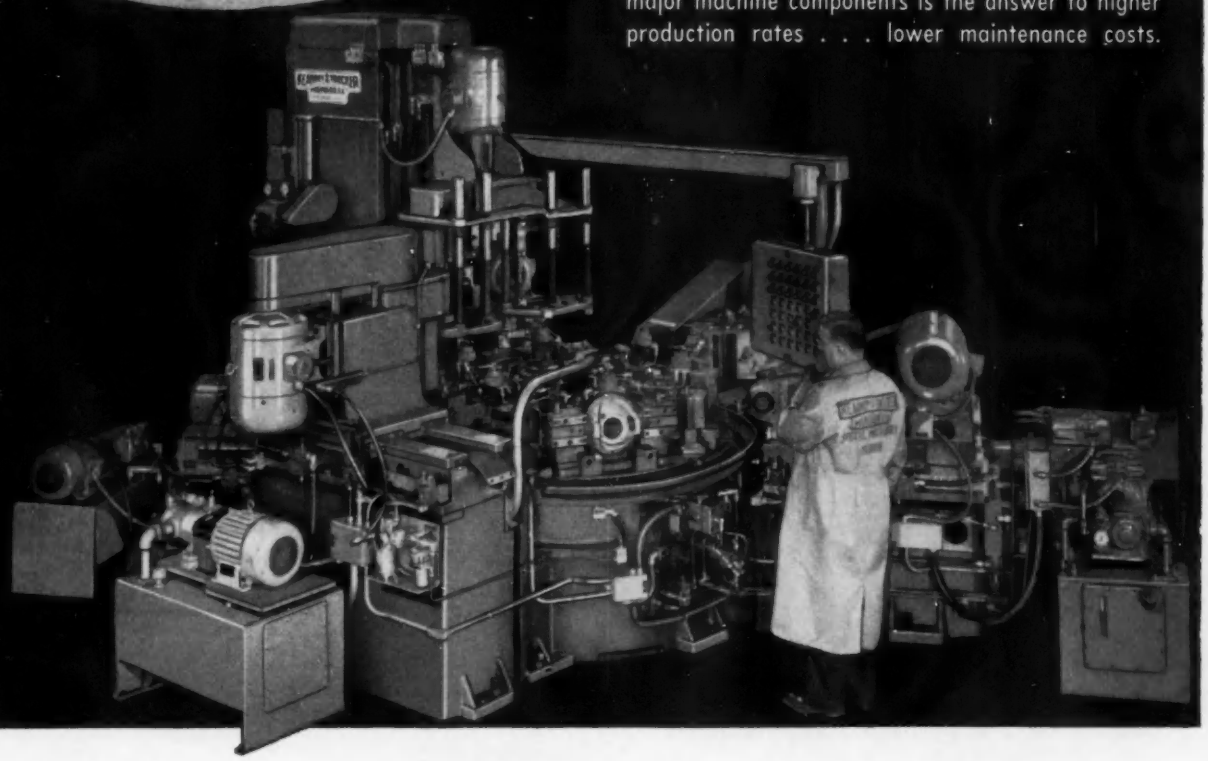
Standard Quill Feed Unit — Simplifies and speeds production of machines which perform drilling, boring, reaming, counterboring and chamfering operations. There's 10″ stroke and a spindle speed range of 200-1690 rpm, which is variable by change gears and sheave diameters. Single or multi-spindle arrangements are possible as well as single or double feed rates. (Data Sheet No. 1055.)

Standard Rotary Index Table — Designed especially for production machines, the Rotary Index Table is a rugged, accurate, self-contained unit for mounting various work-holding fixtures. Unit is available in four

KEARNEY & TRECKER MILWAUKEE

DESIGNED

Kearney & Trecker designed and built this 6-Station Rotary Indexing machine — incorporating nine standard units — to perform a series of milling and drilling operations on rear axle differential carriers at the rate of 82 pieces per hour. Five feed slides, one quill feed unit, two drill power units, and a rotary index table are used. Such standardization of major machine components is the answer to higher production rates . . . lower maintenance costs.



units for lower production machine costs

different table diameters — 36″, 48″, 60″ and 80″. (Data Sheet No. 1018a.)

Standard Way-Type Drill Unit — Designed for drilling, boring, reaming, counterboring and chamfering operations with heavy cutting loads. Entire unit can be mounted at any angle on a production machine. Single or multiple-spindle arrangements as well as single or double feed rates are possible. Completely self-contained spindle head has a speed range of 98-1691 rpm, with 72 increments . . . feed range of 1-16 ipm . . . 140 ipm rapid advance and 260 ipm rapid return. (Data Sheet No. 1075.)

Standard Tapping Unit — This compact, self-contained unit can be arranged to tap any thread from ¼″ to 1″ in diameter in both national coarse and fine series, in addition to six sizes of pipe taps. Spindle speeds range from 80-280 rpm with a choice of three motors, 1, 2 or 3 hp. Single as well as multi-spindle arrangements are possible. (Data Sheet No. 1074.)

For more complete information on standard units, ask for Data Sheets listed under each unit; for details on the 6-Station Rotary Indexing machine, utilizing nine standard components, request Data Sheet No. 1076. See our nearest representative, or write Kearney and Trecker Corp.

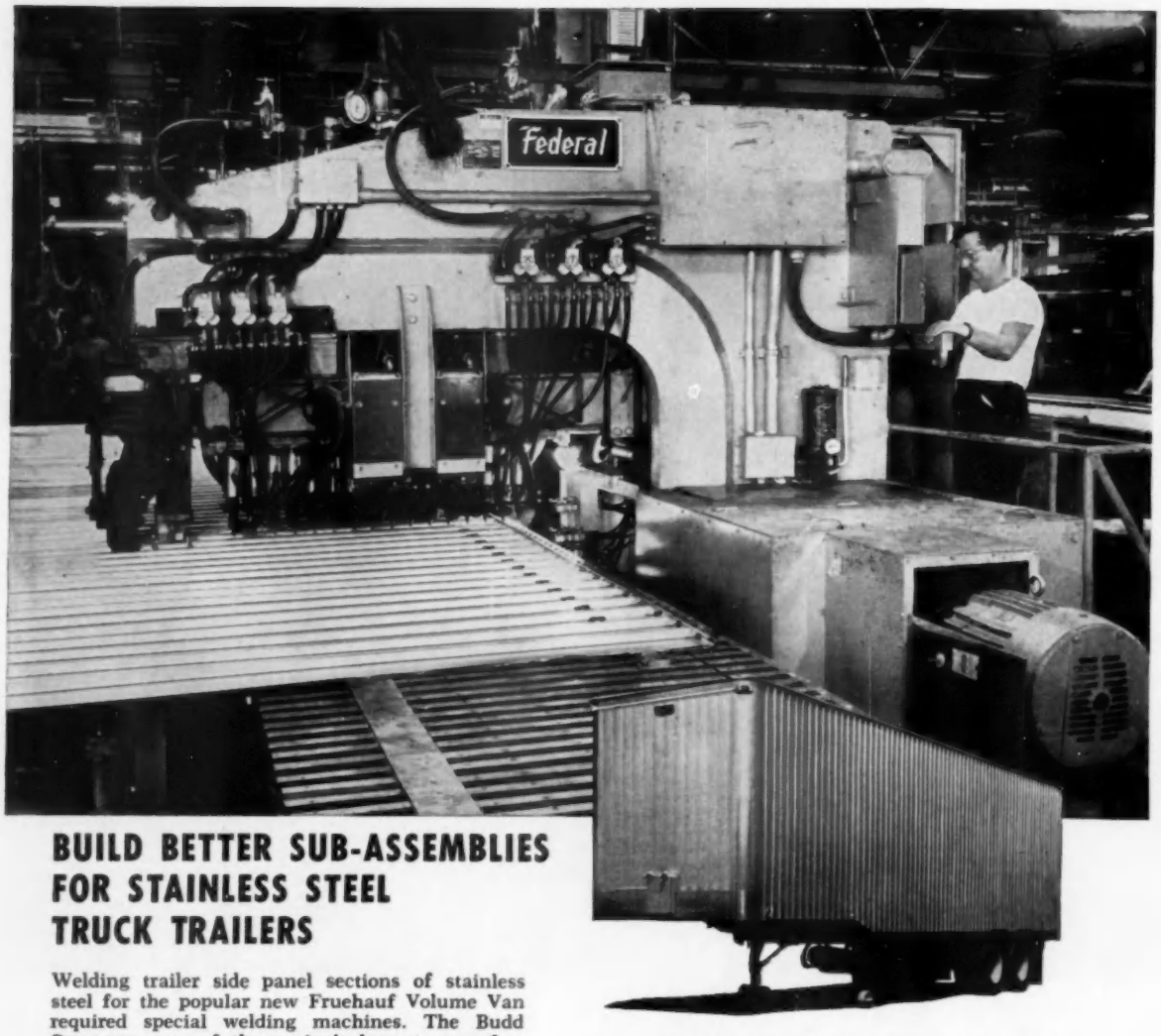
KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Builders of Precision and Production Machine Tools Since 1898

How Federal Helps Budd...



BUILD BETTER SUB-ASSEMBLIES FOR STAINLESS STEEL TRUCK TRAILERS

Welding trailer side panel sections of stainless steel for the popular new Fruehauf Volume Van required special welding machines. The Budd Company, one of the nation's largest manufacturers of transportation equipment, naturally, turned first to Federal.

Federal, in cooperation with Budd, designed and built an ingenious "C" frame multi-spot traveling welder that turned the difficult job of welding side frame panels and structural skirt sections into a high production operation.

Self-propelled on 120 feet of rail, the machine travels over the work which is laid horizontally on a copper shunt die back-up fixture. It features an adjustable slow speed for indexing with a rapid traverse for return. Two rows of tandem piston, double-acting air guns are indexed at right angles to the line of welder travel to permit close spot welding. The machine automatically positions itself and selects gun sequence. Operator, riding with the machine, always has clear view of work, ready access to controls.

Stainless steel sub-assemblies for the Fruehauf Volume Van (above) are fabricated by the Budd Company for Fruehauf.

If your operation calls for special resistance welding — you, like leading manufacturers, should call on *Federal — First in Resistance Welding.*

Federal WELDERS

Warco PRESSES

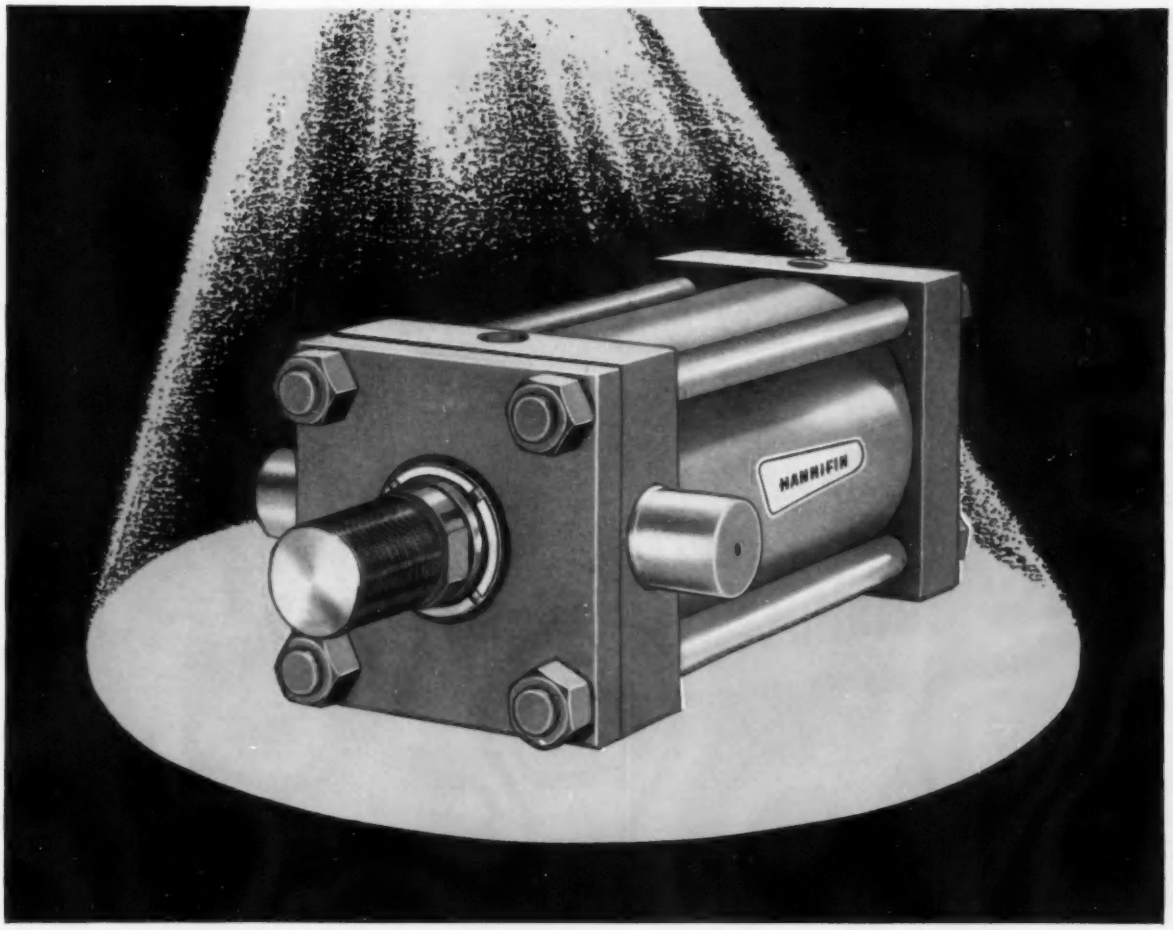
WELDING SHOW

Booth No. 73

THE FEDERAL MACHINE AND WELDER COMPANY

WARREN, OHIO

HANNIFIN AIR AND HYDRAULIC CYLINDERS



When a name is your guarantee of both quality and service

Always. When you specify Hannifin as your air and hydraulic cylinder source.

Let's talk quality. Hannifin manufactures *five* different lines of cylinders. All are made of the finest materials... to the most exacting standards for concentricity and surface finishes...and to proper tolerances for easy, accurate mounting. There are bore sizes and mounting styles to suit every requirement and types of construction to meet every preference.

What kind of service do you need? Hannifin will ship any normal quantity of standard cylinders within 48 hours—in any stroke to 60 inches! Special rod ends, special packings and certain special mountings take only a little longer.

Another service. To help you choose, there's an experienced Hannifin field engineer as near as your telephone. And, when your requirements are really urgent, you can call Hannifin Cylinder Sales at Des Plaines. Your order can be in the shop the same day.

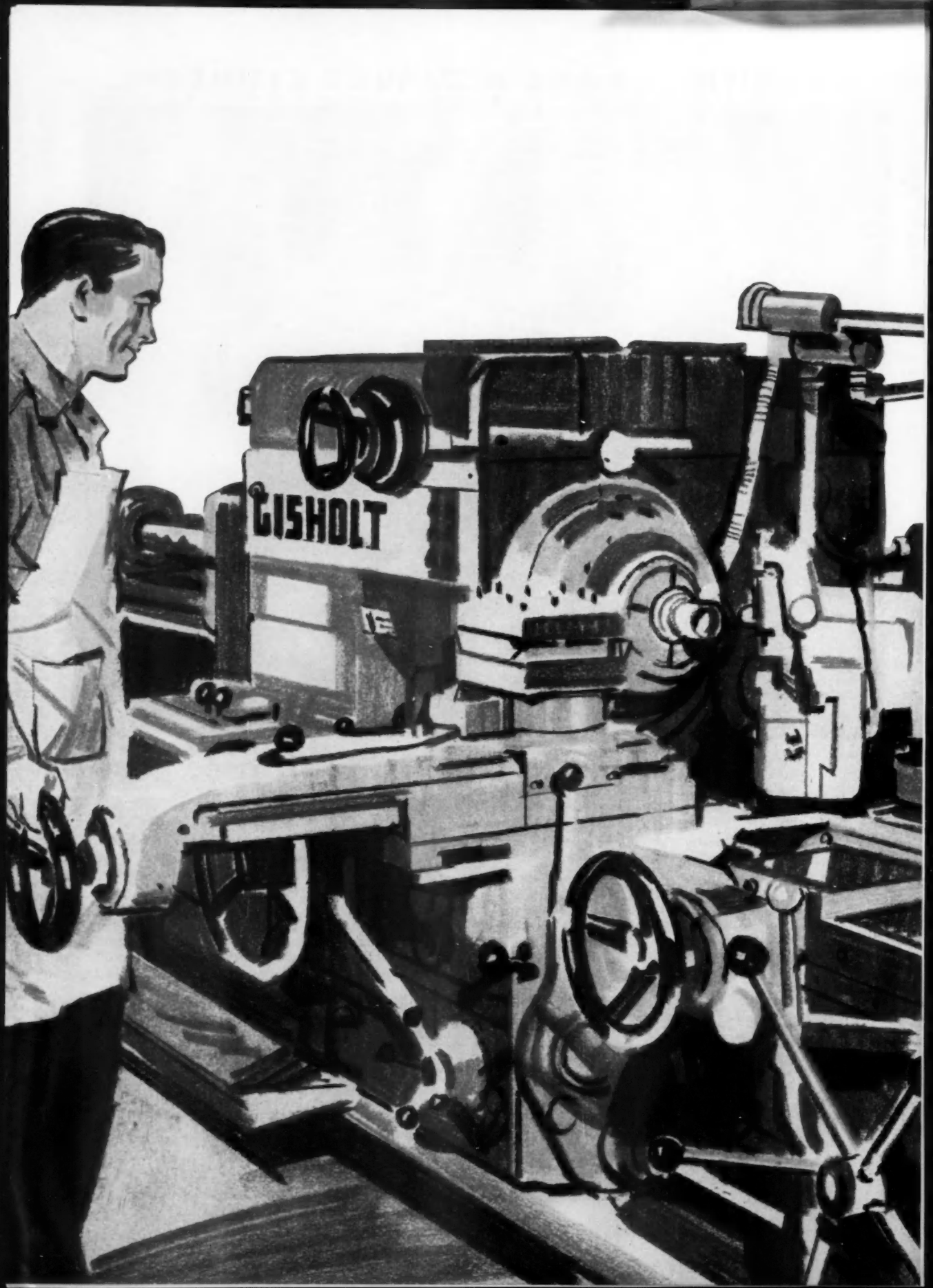
HANNIFIN

MAIL THIS COUPON FOR PROMPT ACTION

- ☐ Have Field Engineer call at once
- ☐ Have Field Engineer stop by soon
- ☐ For the present, just send complete catalog information on Hannifin cylinders including prices

Hannifin Corporation, 543 S. Wolf Rd., Des Plaines, Ill.

Name.....*Title*.....
Company.....
Address.....
City.....*Zone*.....*State*.....


GISHOLT

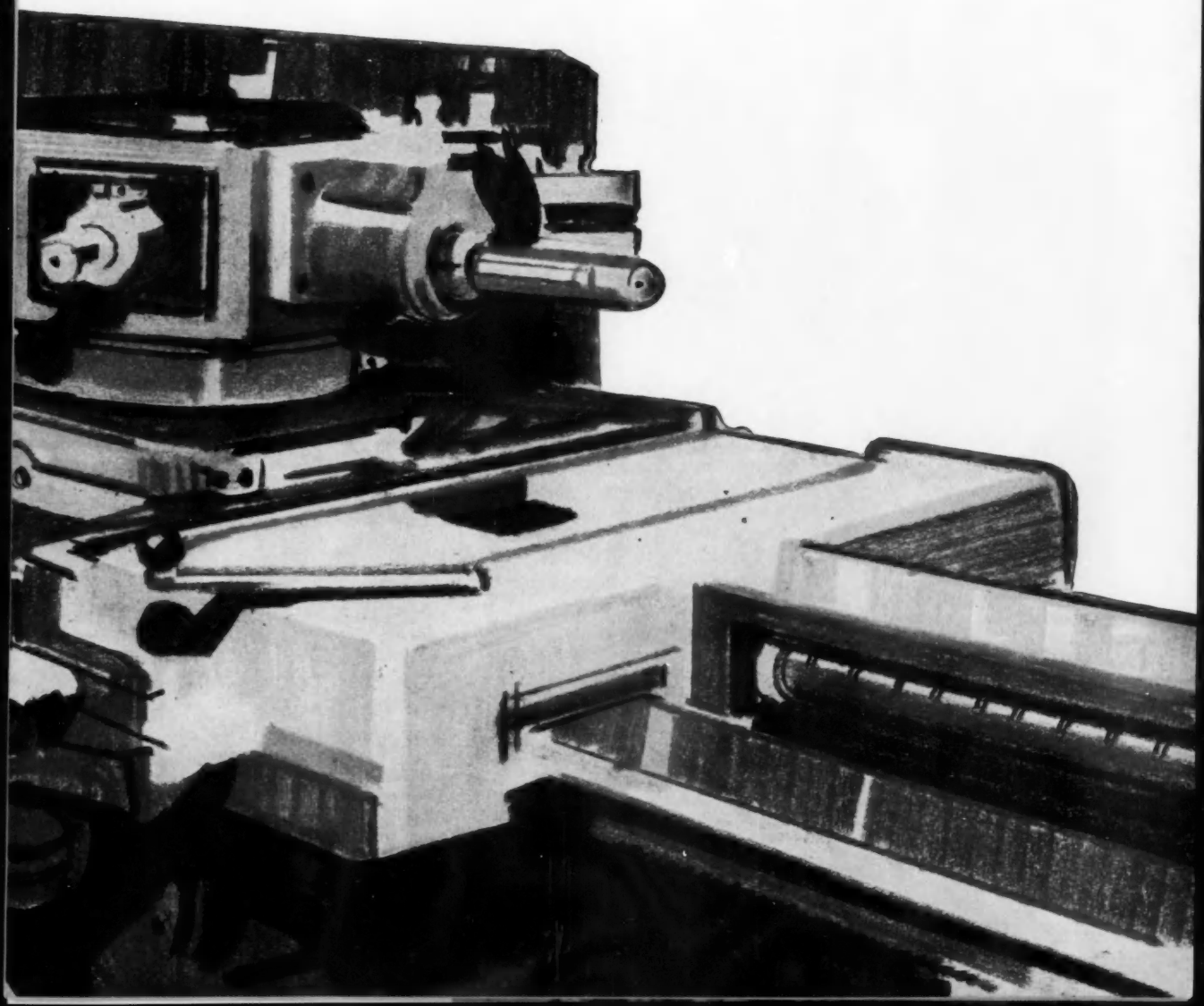
GISHOLT MASTERLINE SADDLE TYPE TURRET LATHE

MASTERLINE GISHOLT SINCE 1887

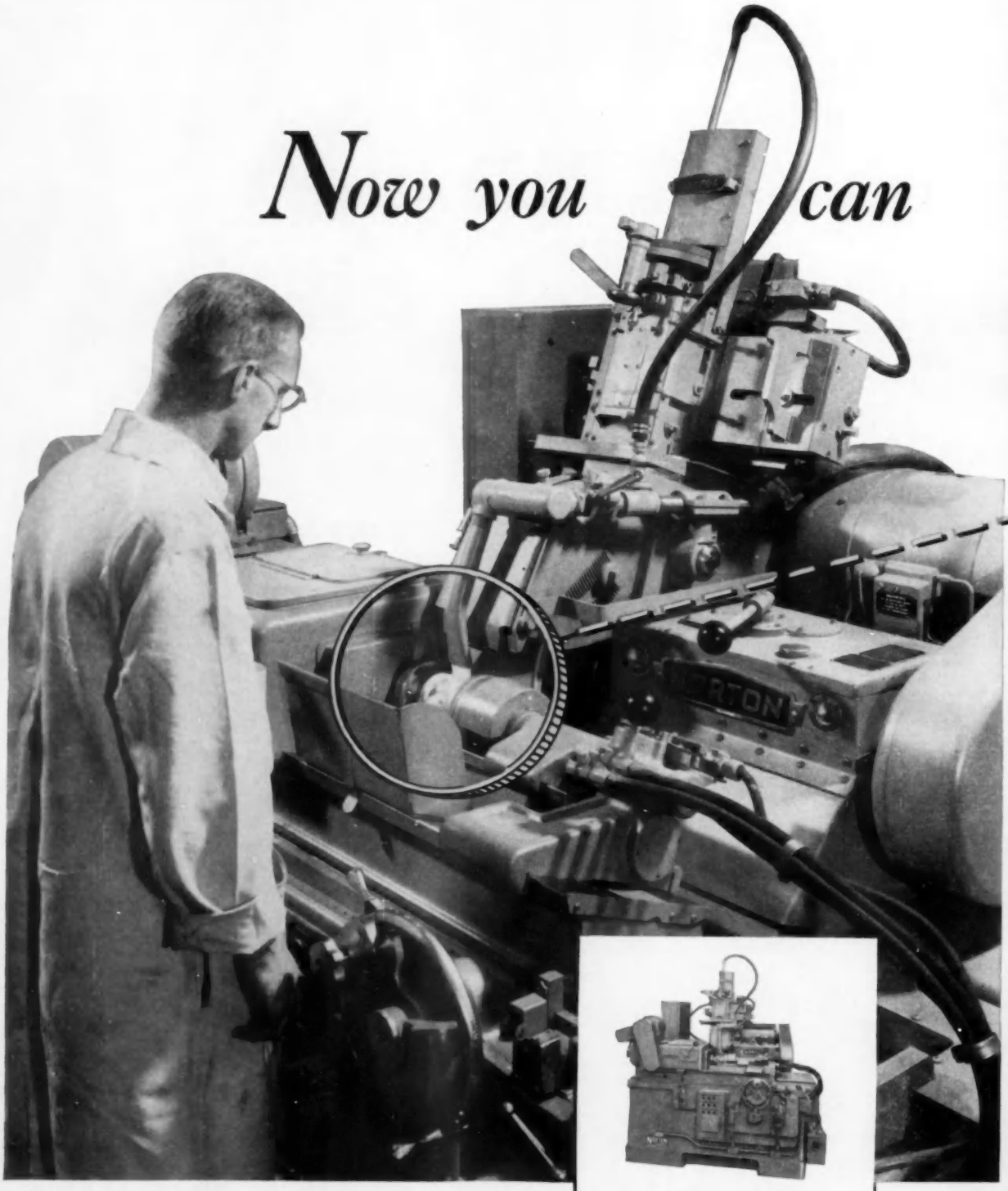
Throughout the metalworking industry, Gisholt High Production Saddle Type Turret Lathes are known for simpler controls, ease of operation, wide adaptability and sturdy construction. Gisholt continues to set the pace with the new MASTERLINE series—outstanding in ability to handle rugged jobs, with ample power and massive weight to withstand deep cuts at punishing feeds without vibration. Let us tell you more about these machines—and how they can be applied profitably to your manufacturing processes.

Gisholt Machine Company, Madison 10, Wisconsin

Look ahead—keep ahead—with Gisholt



Now you can



Designed For Heavy Duty, High Production Service, the Norton 6″ x 8″ Semiautomatic Piston Grinder produces standard automotive and other types of pistons fast and economically.

Ideal For Automation. Already greatly simplified in operation, and with many automatic features, this advanced grinder is adaptable to complete automation. Particulars on request.

grind pistons better

The Norton 6"x8" Semiautomatic Piston Grinding Machine produces more pistons and lowers your costs

Fast automatic sizing is just one important advantage of the Norton 6″ x 8″ Piston Grinder. This is assured by the repetitive accuracy of the easily adjustable "micrometric-type" revolving screw wheel feed mechanism — *plus* the heavy wheel spindle unit that resists wheel pressures — *plus* the rugged cam generating mechanism that provides enduring accuracy of the motion required for piston skirt form. And this rapid action is built-in for the life of the machine, thanks to massive proportions and generous wear surfaces.

Other High Production Advantages:

- *Simplified Operation* that reduces operator fatigue through convenient location of controls. The operator can make all adjustments for feeds and speeds without leaving his normal position.
- *Automatic Functioning* that operates at a pre-determined pace, hour after hour, minimizing effort and preventing production lag due to operator fatigue.
- *Automatic Grinding Cycle*, operating under electrically timed control and adjustable over a wide range. Starting at the touch of a single lever, the grinding cycle terminates at the pre-set time, ready for removal of the work. (Rotation of the work may be stopped automatically, in the most convenient unloading position, by an optional "electric-eye" arrangement.)
- *Automatic Wheel Truing*. Merely touching a push-button sends the automatic wheel guard type truing device on a round trip across the wheel face at pre-determined speed and feed. This not only lessens the time and skill usually required for truing, but gives closer control of the amount of abrasive removed, thus reducing the wheel cost per piece ground.

Get the Whole Story

on how the Norton 6″ x 8″ Semiautomatic Piston Grinding Machine can benefit your production. See your Norton Representative, or write direct for Catalog No. 742. And remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Massachusetts *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

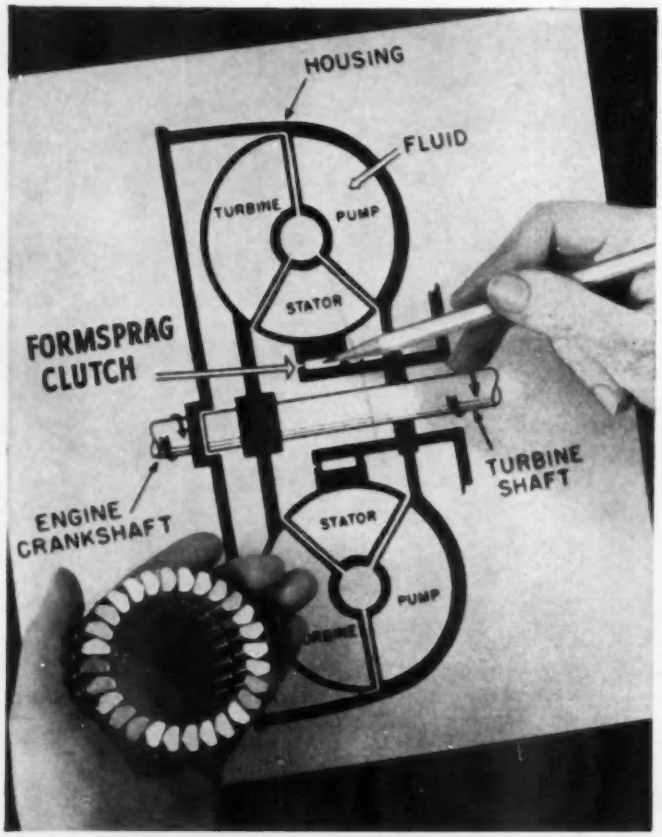
***To Economize, Modernize With* NEW**

NORTON

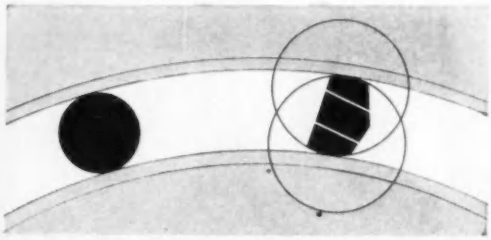
GRINDERS and LAPPERS

Making better products . . . to make other products better

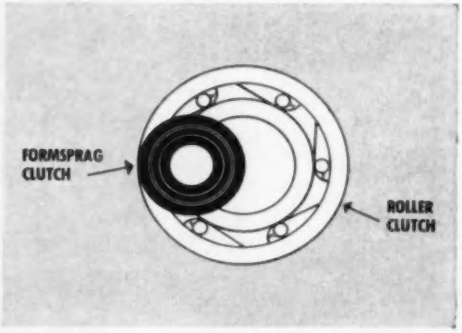
District Sales Offices: Worcester • Hartford
New York (Teterboro, N. J.) • Cleveland • Chicago • Detroit



Formsprag Clutches shown in a typical transmission torque converter. Basic principles insure maximum torque in minimum area.



Forcing a roller into a curved, wedged space is an old, over-running clutch principle. The sprag is, in effect, a "roller" of increased diameter—therefore, of increased torque capacity. By increasing the diameter of the roller, you get considerable increase in load carrying ability.

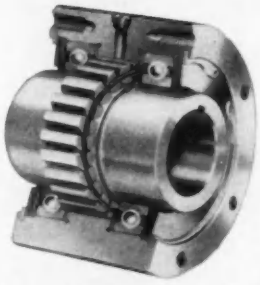


Compare it with other types of clutches—note the size of each of the above types of clutches, yet each delivers approximately the same ultimate capacity. Not only does the Formsprag Clutch deliver more torque capacity for size and weight than any other type of over-running clutch, but you are also assured of longer life and greater accuracy through Formsprag's advanced design principles.

How Formsprag Over-Running Clutches give maximum torque in less space in modern Transmission Torque Converters

Inherent in all modern transmissions today is the need for more efficient power in a smaller area—whether sleek, low-slung cars or powerful, rugged road building equipment.
Torque converters in transmissions, of course, have this same requirement. That's why more and more manufacturers are relying on the advantages of Formsprag Over-Running Clutches to simplify their designs.

There are numerous over-running, backstopping or indexing applications where Formsprag Clutches are ideal. The Formsprag engineering staff is thoroughly familiar with thousands of clutch applications. Why not contact Formsprag today for further information and/or design assistance?

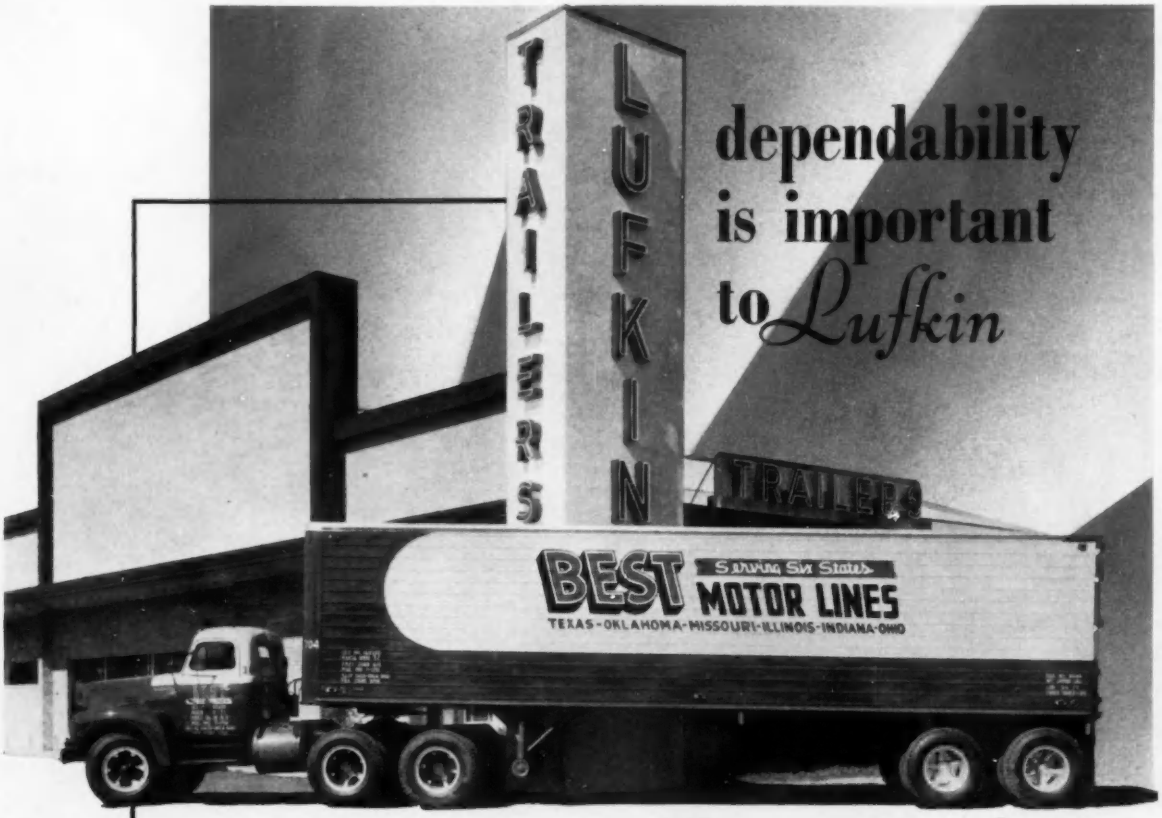


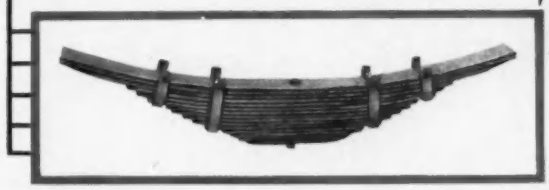
Shown is a typical Formsprag Over-Running Clutch. Applications in light and heavy vehicles are almost unlimited. New applications are being discovered daily.

FORMSPRAG *Company*

Distributors in Principal Cities
23583 Hoover Road, Van Dyke, Michigan
World's Largest Exclusive Manufacturers of Over-Running Clutches

A10-4B





That's why Lufkin depends on BURTON

TRAILERS produced by Lufkin are among the heaviest in the industry . . . designed to carry tremendous loads which impose heavy responsibilities on every structural part of body, frame and chassis . . . and especially on the springs.

Here is where Burton dependability is indispensable . . . for the performance of the springs profoundly influences the performance of the entire vehicle.

We invite you to follow the example of America's foremost trailer and truck manufacturers by bringing your spring problems to the attention of Burton's engineering staff, as early as possible in your planning stages.

BURTON AUTO SPRING CORP.

. . . Vital Support for the Automotive Industry . . .

WESTERN AVENUE AT FORTY-EIGHTH STREET • CHICAGO 32, ILLINOIS

ALLIED

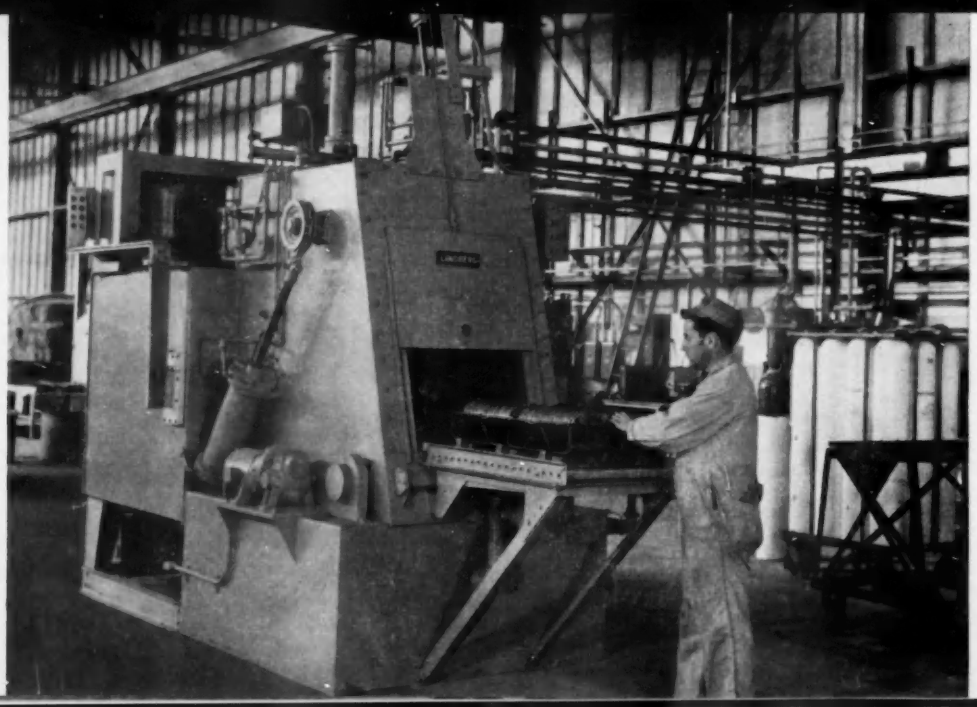
New Lindberg electric furnace with CORRTHERM element at Allied Metal Treating Corporation, Kenosha, Wisconsin. This furnace is used 24 hours a day, 6 days a week, for carbonitriding, clean hardening pinion gears, hardening crank shafts after carburizing and carburizing small gears and shafts.

EKLUND

Installation of new Lindberg furnace with CORRTHERM electric element at Eklund Metal Treating, Inc., Rockford, Illinois. Furnace used 24 hours a day, 7 days a week, for carburizing gears and machine tool parts, carbonitriding sheet metal screws and automotive parts, and hardening and tempering bolts.

PERFECTION

Lindberg electric furnace with CORRTHERM element just installed at Perfection Tool & Metal Heat Treating Company's Lombard, Illinois plant. This furnace is being used 24 hours a day, 6 days a week, for carbonitriding and carburizing parts for automotive and farm implement industries.



COMMERCIAL HEAT-TREATERS QUICK TO ADOPT LINDBERG ELECTRIC CARBONITRIDING FURNACES WITH NEW CORRTHERM HEATING ELEMENT

It is significant that commercial heat-treaters, always in the lead in the acceptance and development of better heat-treating methods, have been among the first to appreciate the revolutionary advantages of Lindberg's newly announced CORRTHERM electric heating element.

Recent Lindberg CORRTHERM-equipped furnace installations in plants of three leading midwestern commercial heat-treaters are shown on the opposite page.

Where electricity is the preferred source of heat Lindberg furnaces with CORRTHERM provide to the fullest degree the versatility and dependability required in efficient commercial heat-treating. Ideal for carbonitriding, they are readily applicable to other processes—carburizing, carbon restoration, bright hardening or annealing, and normalizing.

Whether your heat-treating operations are commercial or captive, large or small, the CORRTHERM element in Lindberg electric furnaces offers you these exclusive advantages:

Low voltage—operates at extremely low voltage. No leakage through carbon saturation.

Atmosphere Circulation—elements act as baffle to direct circulation of convection streams.

Safety—extremely low voltage eliminates shock or short hazards.

Durability—watts density at all time low. Element practically indestructible.

This shows how the new Lindberg CORRTHERM electric heating element fills the furnace with walls of glowing heat. Note also that CORRTHERM is conveniently hung from simple brackets requiring no complicated connections or construction.

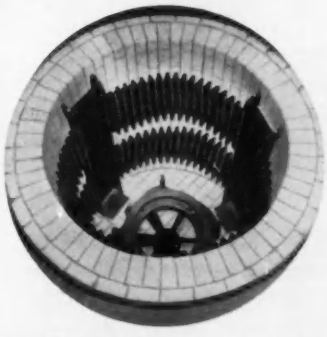
CORRTHERM is an exclusive Lindberg development created in Lindberg laboratories by Lindberg metallurgists and engineers. To find out how its advantages can be applied to your heat-treating processes consult your nearest Lindberg Field Representative. (Look in classified phone book.)

LINDBERG ENGINEERING COMPANY

2491 West Hubbard Street, Chicago 12, Illinois

Los Angeles Plant: 11937 Regentview Ave., at Downey, California

Installation of CORRTHERM elements in one of two large rotary furnaces just erected in the field by Lindberg's associate company, Lindberg Industrial Corporation.



Installation of Lindberg CORRTHERM-equipped carburizing pit-type furnace in plant of Lindberg Steel Treating Co., Melrose Park, Ill.

Safety! Extremely low voltage makes CORRTHERM elements completely safe. Let operator or work load bang it if they will. Neither element nor operator will be hurt

CALENDAR

OF COMING SHOWS AND MEETINGS

National Petroleum Institute, semi-annual meeting, Cleveland Hotel, Cleveland, O. ..... April 18-20

Tokyo Motor Show, Japan ..... April 20-29

American Zinc Institute, annual meeting, Hotel Statler, St. Louis, Mo. ..... April 20-21

Turin Motor Show, Italy .. April 21-May 2

British Industries Fair, London and Birmingham, England. April 23-May 4

International Automobile Show, Coliseum, New York, N. Y. April 28-May 6

German Industries Fair, Hanover April 29-May 8

AMA Conference on Sales Forecasting, Drake Hotel, Chicago, Ill. April 30-May 1

U. S. Chamber of Commerce Annual Meeting, Wash., D. C. .April 30-May 2

AFS Castings Congress and Show, Atlantic City, N. J. ..... May 3-9

Third Annual Conference for Engineers, Ohio State Univ., Columbus, O. ..... May 4

AWS Spring Meeting and Fourth Welding & Allied Industry Exposition, Buffalo, N. Y. ..... May 8-11

Western Material Handling Conference and Equipment Show, Los Angeles, Calif. ..... May 9-11

Mechanical Handling Exhibition and Convention, Earls Court, London, England ..... May 9-19

Design Engineering Show, Convention Hall, Philadelphia, Pa. May 14-17

Automotive Advertisers Council, spring meeting, Homestead, Hot Springs, Va. ..... May 22-25

Production Machine Tool Hydraulic Forum, Engr. Soc. Bldg., Detroit, Mich. ..... May 24-25

National Fluid Power Association annual meeting, Greenbrier, White Sulphur Springs, W. Va. May 28-30

Indianapolis 500-Mile Race ..... May 30

AGMA Annual Meeting, Homestead, Hot Springs, Va. ..... June 3-6

SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. ..... June 3-8

Material Handling Institute 1956 Exposition, Public Auditorium Cleveland, O. ..... June 5-8

American Society for Quality Control, annual convention, Montreal, Canada ..... June 6-8

Seventh National Plastics Exposition, Coliseum, New York, N. Y. June 11-15

National Truck, Trailer and Equipment Show, Los Angeles, Calif. June 14-17

ASTM Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. ..... June 17-22

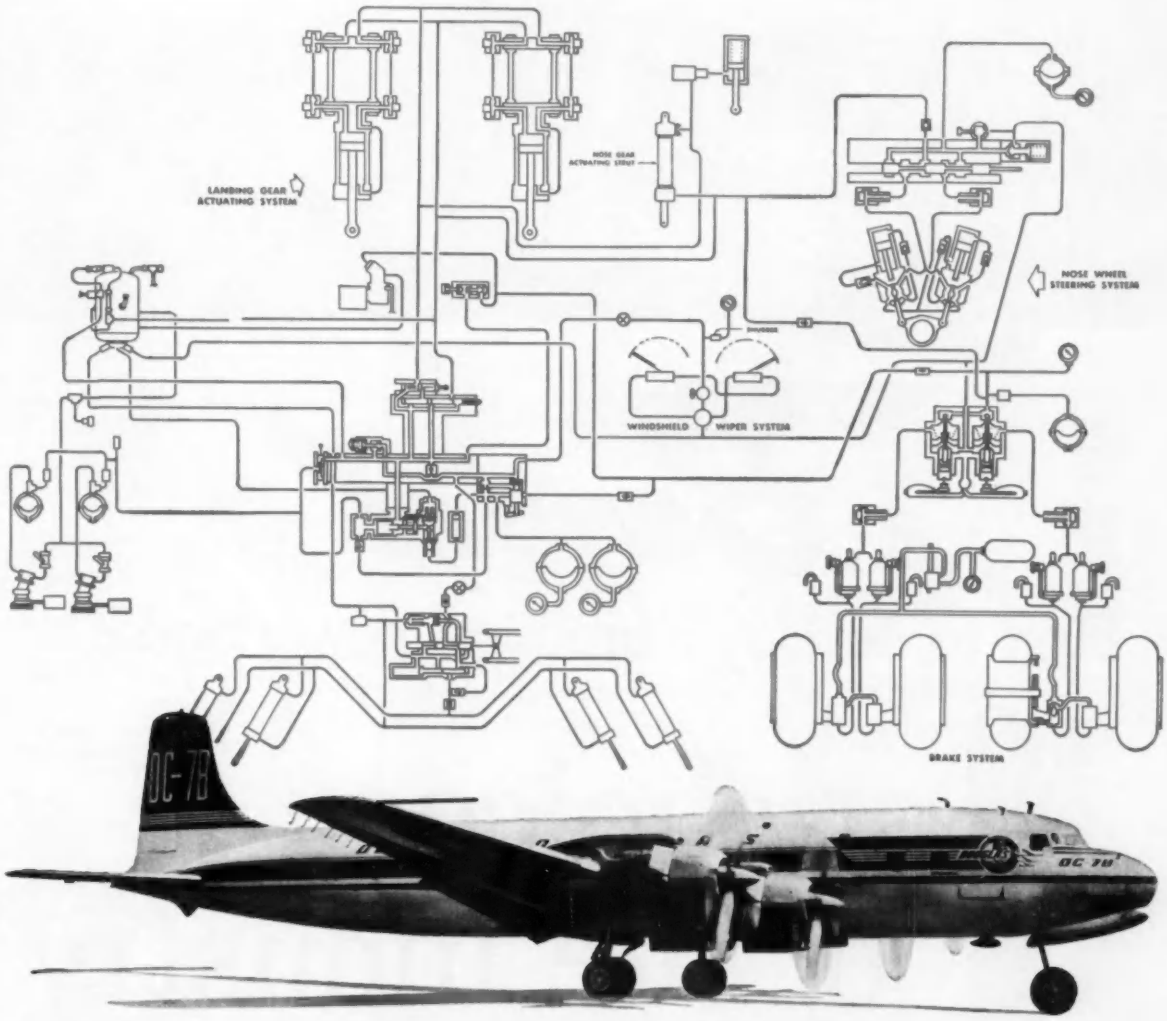
International Machine Tool Exhibition, London, England. June 22-July 6

Drop Forging Association, annual meeting, The Homestead, Hot Springs, Va. ..... June 24-27

Machine Tool Builders' Sales Conference, Purdue Univ., Lafayette, Ind. ..... July 30-Aug. 3

SAE National West Coast Meeting, Mark Hopkins Hotel, San Francisco, Calif. ..... Aug. 6-8

International Ignition Conference, sponsored by Scintilla Div. of Bendix Aviation Corp., Sidney, N. Y. ..... Aug. 22-24



Enjay Butyl rubber— vital artery in newest airliners

Douglas chooses Enjay Butyl for rubber components of the hydraulic systems in many of its famous DC-7 airliners. These components, which help assure the dependable operation of everything from wing flaps to landing gear, are proving over millions of air miles their durability and resistance to wear.

Versatile Enjay Butyl rubber may well have a place in *your* operation. It will pay you to investigate the many technical advantages it has over other types of rubber. Its price and ready availability are advantages, too. For full information, and for technical assistance in the uses of Enjay Butyl, contact the Enjay Company today.

ENJAY BUTYL

ENJAY *Pioneer in Petrochemicals*

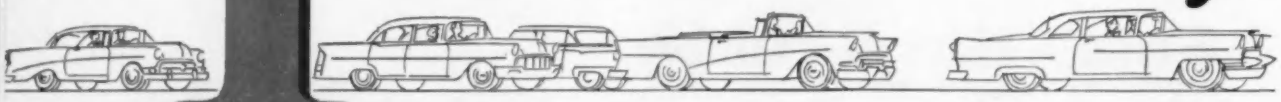
ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.
Other offices: Akron • Boston • Chicago • Los Angeles • Tulsa

Enjay Butyl is the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

Bendix

First to develop a practical power brake

1st choice of the industry!



Only a few years ago power braking for passenger cars was an innovation. Today power braking is one of the most desired new car features. In this relatively short time Bendix has advanced from pioneer builder to prime producer of power brakes.

Obviously this industry-wide acceptance could not have been attained without the unrivaled wealth of diversified experience which Bendix has acquired over the years in successfully meeting the braking problems of the industry.

It is this unique ability to plan for tomorrow as well as to produce for today that makes Bendix* Power Brakes the overwhelming choice of car manufacturers.

Available in low pedal or high pedal design to meet individual manufacturers' specifications, Bendix Power Brakes are a potent source of customer good will from the first mile to trade-in time.

BENDIX PRODUCTS DIVISION SOUTH BEND INDIANA

Export Sales and Service: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

*REG. U. S. PAT. OFF.

BRAKES • POWER STEERING • POWER BRAKING
• CONSTANT VELOCITY UNIVERSAL JOINTS
• HYDRAULIC REMOTE CONTROLS

Bendix Products Division

Bendix AVIATION CORPORATION

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High Spots of This Issue

★ Mechanized Foundry Setup for Pontiac Crankshafts

Featuring automatic handling methods and advanced techniques of mechanization, the GM Danville, Ill., foundry is turning out Pontiac shell-cast crankshafts in full volume. A graphic view of the setup is given here. Page 48.

★ Leipzig Fair Reflects East German Automotive Growth

A good insight into what is taking place vehicle-wise in Communist Germany was presented at the Leipzig Fair last month. This on-the-spot report describes the machines seen and Communist automotive thinking. Page 54.

★ New European Automobiles Displayed at Geneva Show

Seventy-one makes of passenger cars from all parts of the Western automotive world were paraded at the recent Geneva Show. Notable mechanical features of numerous vehicles are pinpointed by the author for the reader. Page 60.

★ Looking Ahead 25 Years in Passenger Car Production

Forecasting is a precarious business at best, but the necessity for it grows daily in such fields as the automotive industries. Mixing the best available data with his own acumen, AI's Detroit Editor takes the leap here. Page 62.

★ Special Manufacturing Techniques for Gas Turbines

Complex problems, peculiar to the product involved, are found in the production of gas turbine engines. Reviewed in this article are some of the methods used by Allison in the manufacture of the T-56 turboprop engine. Page 64.

★ 33 New Product Items And Other High Spots, Such As:

ASTE Show; power augmentation with nitromethane; electroless nickel plating; milling machine for aircraft spars; SAE Production Forum; new Twin Disc torque converter; use of die castings in motor vehicles; and new Diamond T tractor.

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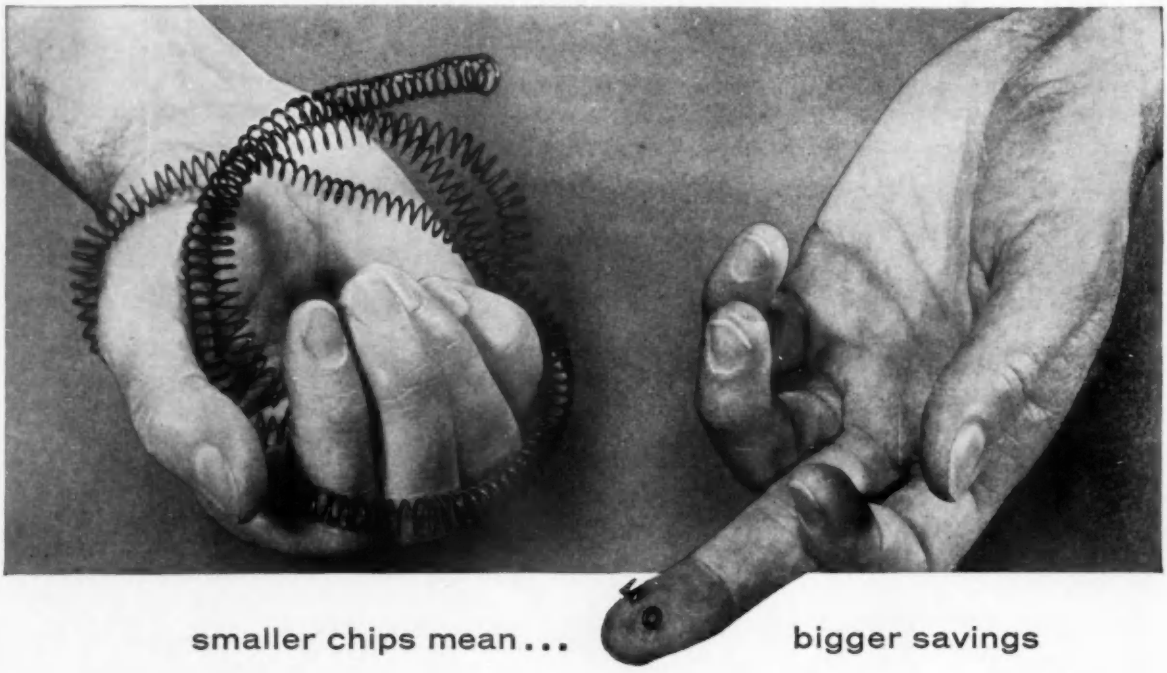


smaller chips mean... bigger savings

Cut costs with RYCUT steels!

Three new Ryerson leaded alloys

These short, fast-breaking chips have real meaning to cost-conscious purchasing and production men. In an ever-increasing number of shops, small chips like these mean that the switch has been made to Rycut steels. They mean that tools are turning faster—that production is up as much as 200%.

The secret of Rycut's machining speed is a minute quantity of lead, finely dispersed throughout the steel. This acts as a lubricant between tool and steel. The results are revolutionizing machine shop practice:

- Up to 200% more parts can be produced per machine hour!
- Tool life is lengthened as much as 300%!
- Finish is improved!

There's a Rycut leaded alloy for every application. Use RYCUT 20 when you need a carburizing alloy; RYCUT 40 for .40 carbon alloy applications; and RYCUT 50 for .50 carbon alloy uses. Every one is a cost-cutter.

Figure how much this increased production and longer tool life would lower costs in YOUR shop—and raise your profits! Call your nearby Ryerson plant today . . . large stocks assure you of quick shipment.

NOW LEADED PLATES—Ryerson's New E-Z-Cut is the first leaded plate steel available from stock. It cuts faster, polishes easier than other free-machining plate steel.

LARGEST LEDLOY STOCKS? Ryerson has them and this leaded carbon steel is the world's fastest cutting.

RYERSON STEEL

In stock: Bars, structurals, plates, sheets, tubing, alloy and stainless steel, reinforcing bars, machinery & tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 114, No. 8 April 15, 1956

Automotive Leader Sloan Quits GM Chairmanship; Bradley In

Alfred P. Sloan, Jr., has retired as board chairman of General Motors Corp. Named to succeed the 80-year-old Sloan is Albert Bradley, executive vice-president and chairman of the corporation's financial policy committee. Harlow H. Curtice continues as president and chief executive officer of the corporation.

Mr. Sloan, who has been board chairman of the company since 1937, will remain as a member of the board and serve as honorary chairman. He joined GM in 1918 as vice-president in charge of accessory operations, and five years later was elected president to succeed Pierre S. du Pont.

In the new executive lineup, Frederic G. Donner, formerly vice-president in charge of the financial staff, succeeds Bradley as executive vice-president and chairman of the financial policy committee. George Russell, former treasurer, succeeds Donner.

Mercury Plans To Offer Turnpike Cruiser In '57

Mercury Div. will offer a Turnpike Cruiser model next year. It will be patterned after the experimental Turnpike Cruiser (see AI, Jan. 15, p. 35) currently on tour throughout the country. It will, however, be greatly modified from the rather advanced styling features of the original experimental car.

AMC, Studebaker Ask States To Reconsider Free Insurance

American Motors and Studebaker will get together with state insurance commissioners in an attempt to straighten out the difficulties which have arisen since the two concerns started offering free accident insurance policies to car buyers.

Several states have forbidden the two car companies to offer the policies. Their basic objection is on the ground that insurance rules do not recognize owners of a specific type of automobile as a group insurance class.

Insurance companies have been the principal objectors to the plans. AMC and Studebaker will ask the states to reconsider their stand.

RESTYLED METROPOLITAN HAS INCREASED POWER

This restyled version of American Motors' foreign-built Metropolitan is available in both convertible and hardtop models. Powered by a four-cylinder Austin A-50 engine that develops 52 bhp at 4500 rpm, the car now has a 12-volt electrical system as standard equipment. Clutch has been enlarged to a diameter of eight in. from 7¼ in.

Automatic Transmissions Go On 93 Per Cent of Pontiacs

A marked increase in the sale of automatic transmissions this year has been reported by several car companies. Pontiac, which introduced self-shift units in 1948, notes that more than 93 per cent of the 1956 cars it built through April 2 were equipped with automatic transmissions. By contrast, automatic transmission installations accounted for only about 70 per cent of total production in 1948.

Peak In Sales, Net, Output Recorded by Ford of Canada

Like its parent company in the U. S., Ford of Canada achieved new records last year in a number of categories, including production, sales and earnings. Although the company's operations were hampered by a prolonged strike in the early part of the year, total sales (including exports) soared by more than 38 per cent above the previous year to an all-time high of $346.1 million. Net income climbed to $20.7 million from $14.2 million in 1954.

Vehicle production totaled 165,710 units, 6½ per cent ahead of the previous record established in 1953. Ford of Canada's share of the total vehicle market rose to 36½ per cent from 34.8 per cent in 1954.

Although truck sales, numbering 20,127, were under the record set in 1953, they were up by 31 per cent above 1954.

News of the AUTOMOTIVE

TEMCO TRAINER IS POWERED BY CONTINENTAL JET

Model 51 primary jet trainer has been developed by Temco Aircraft Corp. to meet current requirements of the military training commands. Powered by a Continental YJ-69-T-9 turbojet engine supplying 920 lb of static thrust at sea level, it has a normal gross weight of 4137 lb. Wing tips, stabilizer tips, tail cone, and engine intake ducts are of molded plastic reinforced with glass fibers, and honeycomb material is used for landing gear doors and for wing panels.

Plymouth May Not Include Three-Speed Drive Till '57

Extension of Chrysler's new three-speed automatic transmission across all the corporation's lines this model year is highly unlikely. Production of the new units is being increased, but requirements of the Imperial and Chrysler models will take up most of the output. Besides, DeSoto is said to be next in line to offer the new transmission.

In any event, it will be many months before enough of the new transmissions will be available to appear on the Plymouth. They certainly cannot be expected before the 1957 models are announced.

Seven Companies Win Contracts Totaling More Than $17 Million

Seven firms will share latest Air Force contracts totaling more than $17 million. Largest one, valued at $5.5 million, will go to Allison Div. for propellers and spare parts for C-130 aircraft.

Other contracts went to: Firestone Tire & Rubber Co., $2 million for engineering services for the Corporal guided missile program; Gilfillan Bros., $2.6 million, also for the same program; Westinghouse Electric Corp., $2.7 million for generators and regulators; Collins Radio Co., $2.1 million for receivers and transmitters; Webster Chicago Corp., $1.8 million for equipment to counteract radar effectiveness; and Eclipse-Pioneer Div. of Bendix Aviation Corp., $1.1 million for attitude gyro and indicator equipment.

First Ford Annual Report Reveals Stock Sidelights

Ford's annual report, released for the first time last month, reveals several interesting sidelights never before made public. For example, it shows that at the beginning of the year more than 100 Ford executives and key employes held, under the company's old stock purchase plan, a large proportion of the stock options under which they were permitted to buy the reclassified stock at $21 a share. The current market price is about $60.

Under the old plan, which was terminated in January, key Ford employes were permitted to exercise options on 484,450 shares between January 1 and February 17 at the $21 price. The report shows that 59 officers and employes were granted options on 446,250 shares on January 18 at $66.

In addition to information previously reported in the company's preliminary report (see AI, March 15, p. 71) the 50-page document disclosed that Ford in 1955 had 8900 car dealers. This figure was approximately 700 more than in the previous year.

The report also showed that the company had an investment of approximately $6.7 million in 65 outlets under its dealer development program. Under the program Ford provides part of the capital toward putting a dealer into business.

The report notes further that production of Pratt & Whitney-designed J-57 jet engines and Boeing B-47 wings accounted for a major part of the company's defense sales. These totaled $259 million last year to leave a $700 million backlog of defense orders at year end.

Four-Door Hardtops Get More Study By Industry

Thorough studies of body structures for four-door hardtops are underway at all car companies. Acceptance of this new model indicates that it may eventually replace the four-door sedan, and automobile manufacturers are concentrating on licking a few remaining problems.

Studies on more rigid center pillar construction are high on the list, since some car makers feel present designs still may need strengthening. There have been a few difficulties, and one company is said to have held back shipment of 5000 four-door hardtops while it tries to rework the center pillars for more rigidity.

Partly Gold-Anodized Grille Is Offered on Packard Cars

Packard is now offering a gold-anodized radiator grille screen which is said to give the entire grille a gold tinted appearance. The "mesh" unit is mounted in the same place behind the grille as the normal chrome piece.

Packard is the first car company to offer a partly gold-anodized grille as standard equipment. Cadillac offers a grille which is gold-anodized throughout as an extra-cost optional item on all models with the exception of the El Dorado, on which it is a no-cost option.

AND AVIATION INDUSTRIES

Lower-Priced Ambassador Line Presented by American Motors

American Motors is offering three Nash models in a new series called the Ambassador Special. Chief reasons for bringing out the new models are to close the wide price gap that existed between the medium-priced Statesman and the higher-priced Ambassador and to accommodate the company's new 190-hp V-8 engine.

The new models in a Super four-door sedan, Super two-door hardtop and a Custom four-door sedan—are built on a 114½-in. wheelbase (same as the Statesman). They feature interior and exterior appointments of the Ambassador model, which comes on a 121½-in. wheelbase. The new Ambassador Special is priced nearly $400 less than the regular Ambassador and resembles it closely style-wise.

Factory list prices of the Ambassador Special, excluding excise taxes and other charges are: Super four-door sedan, $2333; Super two-door hardtop, $2416; Custom four-door sedan, $2541.

Horsepower To Go Up Again On 1957 Cars

The trend toward higher horsepower in passenger car engines will continue in 1957. The increased output will come about largely from higher displacement engines. One of the Big Three lowest-priced makes will offer a V-8 with displacement one inch larger than Cadillac and Chrysler initially offered when they introduced their modern V-8 power plants a few years ago.

Ford Adds More Space To New Parts Plant

Ford will increase the size of its new Rawsonville, Mich., parts manufacturing plant from the original 600,000 sq ft to approximately 780,000 sq ft. The additional space will be used to accommodate the staff and engineering personnel of the Parts and Equipment Manufacturing Div., now housed in the Ypsilanti plant.

Construction contracts for the new plant were awarded to various contractors last month. The company hopes to start some manufacturing operations at the plant this fall. Full operations are expected to get under way by the middle of next year.

The plant will produce powdered metal items, instrument clusters, carburetors, and other automotive parts. It will employ about 1500 persons and that figure is expected to be doubled by the end of 1958.

FORK-LIFTER

Operating here is a combined fork lift and tractor built by Conveyancer Fork Lift Trucks, Ltd. Drive and steering are on two or four wheels, and duplicate steering wheel is provided to give full control in both directions. Power from the Leyland 100-hp, 350 cu in. Diesel engine is transmitted through a Brockhouse torque converter and a Leyland Pneumo-cyclic gearbox. Steering is power-assisted with the pump being driven by the engine. A second pump operates the hydraulic ram for the lifting of the mast.

Pontiac Notes Big Increase In Ratio of Hardtop Sales

The sharp increase in sales of hardtop models by Pontiac is noted in a report which shows that the division is now devoting more than 60 per cent of its production to that body style, compared with about 31 per cent during the 1955 model year. In 1950 the hardtop model accounted for only a little over eight per cent of total output, but the ratio jumped to 19 per cent by 1952.

Republic Sales and Profits Up in 1955 Over Year Before

Republic Aviation Corp. has reported 1955 net profits of $14,731,134 on sales of $547,387,242. The 1955 figures compared with 1954 earnings of $8,976,523 on sales of $323,456,601.

Borg-Warner To Double Outlay For Expansion

Anticipating its second biggest year in sales and earnings, Borg-Warner Corp. is planning to nearly double its capital expenditures program in 1956. The company has earmarked $25 million for expanding its facilities this year, nearly $12 million more than it spent last year.

Most of the 1956 expansion funds will be allocated to three projects. These include: the Marbon Chemical Div.'s new chemical plant in Washington, W. Va.; the Byron Jackson Div.'s new electronics plant in Santa Ana, Calif.; and the multi-million dollar research center being constructed in Des Plaines, Ill. An $11 million plant in Letchworth, England, also is included in the 1956 program.

GM Motorama Winds Up 1956 Tour In Boston

The GM Motorama will make its final appearance of the year at Boston, where it opens an 11-day run April 19. In San Francisco, where it closed a nine-day showing early this month, it drew 506,921 visitors to surpass the 1955 total of 500,022. Boston is the fifth city the Motorama will have visited this year.

News of the AUTOMOTIVE

TRUCK FACTORY SALES SHOW 28.5 PER CENT RISE OVER '55

1956 U. S. Motor Vehicle Factory Sales*

	Passenger Cars	Trucks	Buses	Totals 1956	Totals 1955
January	591,032	98,968	253	690,253	725,379
February	560,924	102,384	278	663,586	744,942
Total—Two Months	1,151,956	201,352	531	1,353,839	1,470,321

1956 U. S. Motor Truck Factory Sales by G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	43,550	16,284	3,307	19,268	4,720	5,224	6,615	98,968
February	43,600	17,653	3,665	18,989	6,319	5,342	6,816	102,384
Total—2 Mos. 1956	87,150	33,937	6,972	38,257	11,039	10,566	13,431	201,352
Total—2 Mos. 1955	72,432	26,332	6,704	28,400	8,618	6,102	8,149	156,737

* Automobile Manufacturers Association.

Plymouth To Limit Output Of Fury To 5000 A Year

Plymouth has increased the production goal on its Fury model (see AI, Jan. 15, p. 35) to 5000 a year from the original 1500. The company reportedly does not want to go above that figure, however, in order to retain the Fury as a prestige car.

Ford Confirms Report It Will Have Push-Button Drive in '57

Henry Ford II has confirmed that his company will offer push-button automatic transmission controls in at least part of its line next year. He made the statement during the Monroney hearings in answer to a question about uniform location of automatic transmission controls. GM also is reported interested in push-button transmission controls located in the steering wheel.

Can Union 'Harass' Employer? High Court Reviews Decision

A U. S. Appeals Court decision, which gives a labor union the right to use harassing tactics on an employer to win its demands, may have far reaching effects. The automobile industry is watching the outcome of the case, now being reviewed by the Supreme Court, with considerable interest.

The particular case involves a local of the CIO Textile Workers and Personal Products Corp. of Chicago. According to the Appeals Court decision, the union had the right to force its contract demands through such pressure tactics as walkouts, slowdowns and refusal to work overtime.

Since such action is generally considered contradictory to rules of the National Labor Relations Board, the decision was appealed to the high court. Although such pressure methods have been used by the unions ever since they were organized, this is the first ruling of its type ever handed down by a court.

GM Diesel Equipment Div. Expands In Grand Rapids

General Motors will add 192,000 sq ft of floor space to its Diesel Equipment Div. plant in Grand Rapids, Mich. It will be used for manufacturing operations which are at present located in a leased plant in that city.

When completed in 1957, the addition will increase the Diesel Equipment Div.'s space in Grand Rapids to more than 765,000 sq ft. The addition also will enable the division to expand its research on fuel nozzles.

Caterpillar To Construct New Plant Near Aurora, Ill.

Part of a $190 million expansion program, a new 1.25 million sq ft plant will be built by Caterpillar Tractor Co. near Aurora, Ill. It will make basically the same products as the Peoria plant.

Freight, Wholesale Charges Adjusted by American Motors

American Motors Corp. last month joined the Big Three automobile companies in adjusting freight rates throughout the country. Car dealers located from 500 to 1200 miles from AMC's factory in Kenosha, Wis., will derive the most benefit from the new price structure.

Under the new schedule, freight savings range from $1 on a four-door Rambler shipped to Detroit, to more than $55 on the Ambassador and Hornet V-8 models. While dealers located at points nearest the factory and those farthest away will realize slight savings, the largest reductions will apply to those located in the Denver and Dallas areas.

At the same time, wholesale prices were increased from $22.50 to $30.40. Actual costs of cars to dealers now will be more uniform throughout the country.

One '57 Car To Have Curved Side Windows

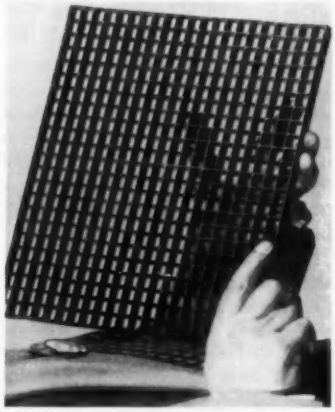
Curved glass side windows and a windshield that wraps over into the roof will appear on at least one high-priced automobile for 1957. Cost, however, will bar curved windows in lower-priced cars for the present, although it is hoped eventually to make it competitive in price with regular flat glass.

Pulling Power of Helicopter Found Prized Asset by Navy

Navy tests of the helicopter in sea mine counter-measures reveal the appreciable pulling power of rotary-wing aircraft.

A helicopter has towed surface vessels weighing 40 to 400 tons at speeds greater than the vessels can attain under their own power. This strength enables the aircraft to tow a paravane for sweeping simulated mine fields in sea lanes.

Armament Div. of the Navy Bureau of Aeronautics is urging greater emphasis on the helicopter as a mine-clearing instrument. The Bureau also points out the value of the helicopter in rescuing disabled surface craft.



PLASTIC MOLDING METHOD

Transition molding process developed at Northrop Aircraft, Inc., produces the complex grid pictured above. It is made of epoxy resin by a three-stage molding process. Original female mold is milled from a block of Cerrobend. An epoxy resin master is cast in this mold and removed by melting the alloy. An elastomer is then poured around the master part to produce a flexible mold.

Car Output Stabilized To Cut High Inventories

Automobile production is now fairly well stabilized at a little over 130,000 units a week. It probably will remain at that level for several weeks yet until high inventories, estimated at about 815,000, are reduced.

It is unlikely that output will go beyond the present weekly average until stocks of new cars drop to at least 700,000. If sales continue to increase as they have in the past several weeks, output may be hiked slightly later this spring and summer.

AMC Builds Two Millionth Car Of Single-Unit Construction

American Motors Corp. last month built its two millionth single-unit construction car. The company built its first monocoque body in August, 1940, and Hudson adopted it in 1948. AMC is the only car company using monocoque bodies at present. Several other companies are studying the design, and at least one automobile manufacturer reportedly will switch over to it on 1958 models.

AI TABLOID

General Motors Corp. will erect its new B-O-P Assembly Div. plant (see AI, April 1, p. 33) at Sunnyvale, Calif., about 40 miles southeast of San Francisco.

* * *

Ford Motor Co. has donated $1 million to set up an annual award for the person or organization making the greatest contribution to peaceful atomic energy.

* * *

Fruehauf Trailer Co. is among the participating concerns in the formation of a $50 million atomic power company.

* * *

Electric Auto-Lite Co. has projected a capital improvements budget of nearly $19 million for 1956.

* * *

De Soto is now offering instrument panel safety cushioning and nylon cord white wall tires as optional equipment on all models.

* * *

Baker-Raulang Co. has established a new branch office in Dallas, Tex.

* * *

Vertol Aircraft Corp. and the French concern of SNCASO have reached an agreement for the latter to order a large number of H-21C helicopters.

* * *

American Chain & Cable Co., Inc., has disclosed plans for the construction of a new branch manufacturing plant at Fairfield, Ia., for its Automotive & Aircraft Div.

* * *

Caterpillar Tractor Co. will hold opening ceremonies at its new wheel tractor and motor grader manufacturing plant at Decatur, Ill., on May 21.

Bendix Aviation Corp. has started construction of two new facilities at Palmdale, Calif., for the testing and servicing of equipment for military air bases and manufacturers of jet aircraft.

* * *

Goodyear Tire & Rubber Co. is planning a $114 million plant expansion program.

* * *

Wayne Works, Inc., has purchased A. J. Miller Co. The former is a large manufacturer of bus bodies, while the latter is a prominent maker of funeral coaches and ambulances.

* * *

Elwell-Parker Electric Co. this year is celebrating its 50th anniversary of industrial truck production.

* * *

French concern of SNCASO has developed a new all-weather jet fighter called the Vautour.

* * *

Willys Motors, Inc., has made available LPG and natural gas conversions of its L-Head and F-Head industrial engines as optional equipment.

* * *

Norton Co. will hold an Open House from May 7 to 9 to mark the opening of its new Santa Clara, Calif., plant.

* * *

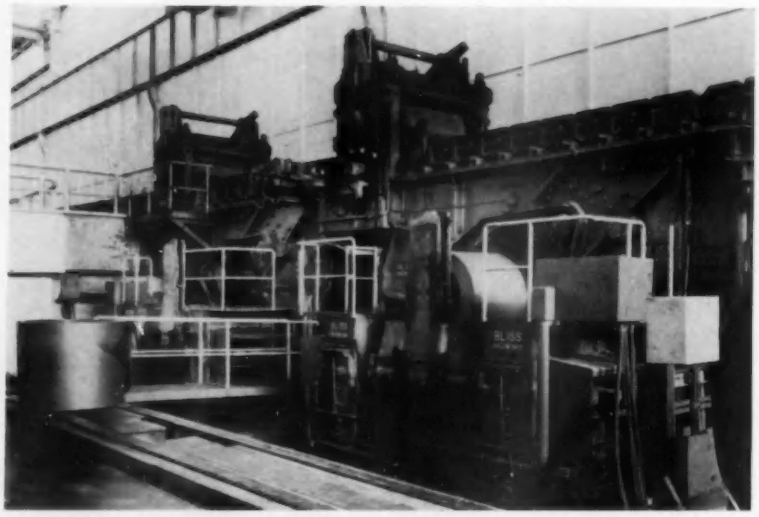
Torrington Co. has purchased the business and assets of Progressive Manufacturing Co. . . . U. S. Hoffman Machinery Corp. has purchased a majority interest in Anton Electronic Laboratories, Inc.

* * *

Aluminum Limited Sales, Inc., has developed a new process of anodizing aluminum wire.

(*Turn to page* 184, *please*)

News of the AUTOMOTIVE



BLISS DOWNCOILERS AID GERMAN STEEL PRODUCTION

These two downcoilers help to speed production of hot strip in the steel plant of August Thyssen-Hutte A.G., at Duisburg-Hamborn in Western Germany. Designed and built by E. W. Bliss Co., the new units are of the expanding mandrel type. The coil ID is gripped tightly by the rotating mandrel, maintaining tension on the strip and winding a tight, smooth-edged coil. Bliss also designed and built the two upenders.

ONLY TWO MAKES SHOW GAINS OVER 1955 QUARTER

1956 Passenger Car Production

As reported direct to Automotive Industries by the car factories

	March 1956	February 1956	March 1955	Three Months 1956	Three Months 1955
Hudson	4,226	4,463	10,365	13,358	19,477
Nash	10,002	9,073	15,528	29,414	29,692
Total—American Motors	14,228	13,536	25,893	43,772	49,169
Chrysler	11,219	11,330	23,520	35,624	58,053
De Soto	10,480	9,757	15,813	32,738	43,288
Dodge	16,156	14,893	35,208	54,797	99,397
Plymouth	39,654	38,954	79,680	130,691	211,794
Total—Chrysler Motors	77,509	74,934	154,221	254,050	412,533
Continental	134	260		767	
Ford	123,518	111,156	157,672	382,457	438,808
Lincoln	3,389	4,956	4,479	14,096	11,064
Mercury	19,395	21,516	39,756	63,848	107,010
Total—Ford Motor Co.	146,436	137,888	201,907	441,168	556,712
Buick	61,456	62,841	79,034	191,382	205,578
Cadillac	14,819	14,220	15,384	43,235	43,016
Chevrolet	164,087	152,664	173,030	468,429	481,041
Oldsmobile	48,919	50,447	58,593	149,532	157,266
Pontiac	37,962	38,208	59,894	114,405	157,496
Total—General Motors	327,243	318,380	385,935	966,994	1,044,397
Packard	3,008	220	8,441	7,021	19,664
Studebaker	7,491	9,739	16,147	31,582	42,855
Total—Stud.-Pack. Corp.	10,499	9,959	24,588	38,603	62,519
Total—All Makes	575,915	554,697	792,544	1,743,567	2,125,330*

* Does not include 3,887 cars produced by Willys Motors, Inc.

Lincoln and Cadillac Ring Up Only Output Gains in Quarter

Automobile production figures (see table on this page) for the first three months show that Lincoln and Cadillac were the only car makers which built more cars this year than in the same period last year. Output by all other companies was down under the 1955 totals.

Total truck production, on the other hand, was far ahead of 1955 to result in a record first quarter in total vehicle output for one company. Although Chevrolet built approximately 12,000 fewer cars than last year, its total vehicle output reached a record for the quarter as a result of its exceptionally high truck production. The latter climbed to more than 100,000 units from slightly over 67,000 during last year's similar quarter.

Although car production in March rose slightly above February, the industry wound up the first quarter with a total of 1.74 million cars. This was more than 25 per cent under the 1955 quarter, when 2.12 million cars were turned out. Nonetheless, it gave the industry its second best first quarter on record.

Output for the second quarter looks good with the most conservative estimate at about 1.79 million cars. There were 2.1 million cars built in the April-June period last year.

GM Technical Center Set For Dedication Next Month

General Motors will dedicate its huge technical center north of Detroit on May 15 and 16th. The research facility, estimated to cost very close to $150 million, has been several years in the building.

Automobile Producer Studies Plexiglas For Rear Windows

One of the Big Three car companies is experimenting with Plexiglas for rear windows on its sports cars. Principal advantage would be much easier forming into complex curvatures than is possible with ordinary glass. Visibility is said to be equal to that of regular automobile glass.

AND AVIATION INDUSTRIES

Results of Gas Turbine Run Not Surprising to Chrysler

Chrysler's cross-country test of its gas-turbine-powered Plymouth (see AI, April 1, p. 37) turned up no surprises for the company's engineers who had been testing the vehicle rigorously at their proving grounds. Mileage of between 13 and 14 mpg at cruising speeds of 40 to 45 mph on the 3000-mile run was about as expected.

White gasoline was used rather than kerosene or fuel oil in order to make a fair comparison with a normal piston engine car. Only two minor failures occurred. The most important element, the high speed turbine itself, came through without a flaw. The turbine idles at 20,000 rpm with a maximum of 50,000 rpm in operation.

Efficiency of the heat exchanger was 86 to 87 per cent on the trip to account for the fuel economy. Since the turbine car first was developed, temperature, idling, and top speed have been brought under automatic controls. Engine friction has been reduced, and combustion generally improved.

Basic purpose of the transcontinental run, the first such journey by an automobile powered by a gas turbine, was to test acceleration and handling in various traffic and climatic conditions. The minor failures on the trip included a faulty bearing in the reduction gear (attributed to overheating) and a cracked intake casting.

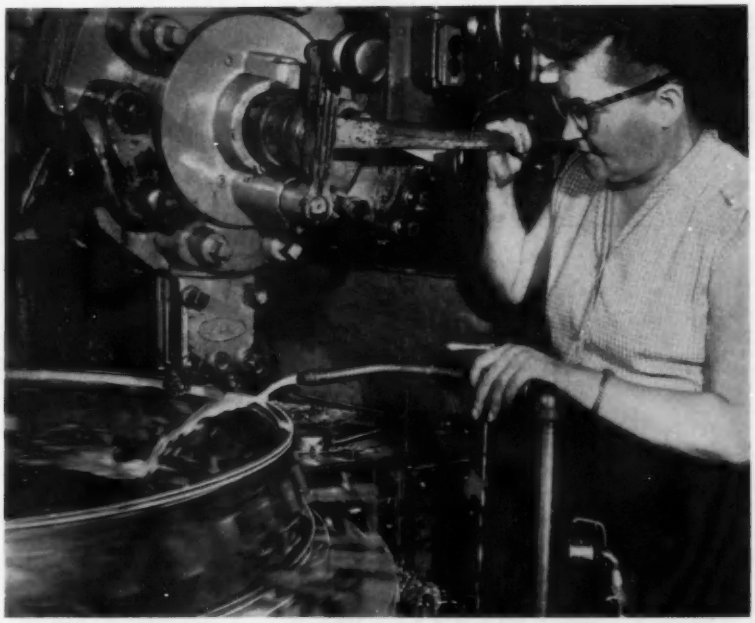
Former Hudson Plant Leased By Cadillac

A small section of the former Hudson plant near Connor and Harper Aves. in Detroit is being leased by Cadillac from the Hudson-Detroit Corp., an investment group which bought the one million sq ft facility from Hudson last year. Cadillac will use the plant for sheet metal operations on fenders, hoods, and some smaller components.

Continued on Page 94

SHEFFIELD LABORATORY MEASURES TO FINE DEGREE

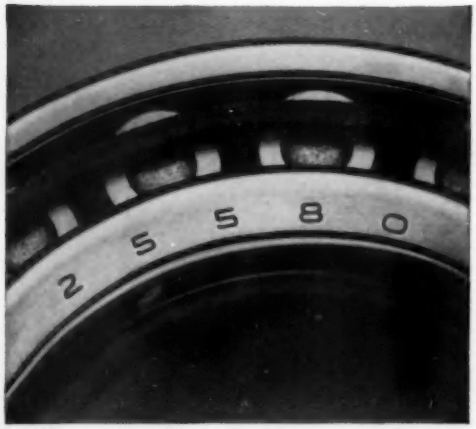
Metrologist in new Eli Whitney Metrology Laboratory of The Sheffield Corp., Dayton, O., is shown setting up an interferometer. It will measure the absolute length of a two-in. master gage block to an accuracy of one-millionth of an inch. The new laboratory has been opened by Sheffield as a further addition to its resources for providing industry with precise measurement facilities comparable to those to be found anywhere.



COST-SAVING TOOL BLANKS FOR MACHINING WORK

Operator at Solar Aircraft Co. is shown machining a compressor case of a jet engine using a Carmet CA-160 throw-away tool blank; two facing cuts are made on each part. The blanks are also used in the machining of selected gas turbine components.

If this number could talk...and it can!



THE NUMBER 25580 on the bearing cone, coupled with 25520 on the cup, tells you that this is a certain size of tapered roller bearing commonly used in differentials. With the trademark "Timken®" also on the bearing, the number tells you about the bearing's fine quality and the services that go with it.

TO GET STEEL GOOD ENOUGH for Timken bearings, we make our own. (No other American bearing manufacturer does). Even though we think it's the finest bearing steel ever developed, we're always checking and looking for ways to improve it. For instance, we use this X-ray diffraction unit to study the residual stresses present in heat-treated steel parts.

NAME YOUR REQUIREMENTS—we'll meet them from the 5,850 sizes and 26 types of Timken tapered roller bearings that we can make in any quantity. For value, always specify "Timken" with the bearing number. And for *full* value, always use a Timken bearing cup with a Timken bearing cone. The Timken Roller Bearing Company, Canton 6, Ohio.

WE LEAVE NOTHING TO CHANCE. Every one of these bearing cones has already passed the most rigid inspections. Yet these women make an extra one. They take one last look for surface defects, too tight or too loose cages, and once more check the bore dimensions. This extra inspection is another step that makes Timken bearings the number 1 value in your car's moving parts—the vital zone.

TIMKEN is number 1 for VALUE

TRADE-MARK REG. U. S. PAT. OFF.

NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↓ AND THRUST →◫← LOADS OR ANY COMBINATION →✳←

Men in the News

Milford Rivet & Machine Co.—Vincent L. Bradford has been made executive vice-president.

Hudson Motors Div., American Motors Corp.—**Virgil E. Boyd** has been appointed general sales manager.

Bendix Aviation Corp., Utica Div. —**Walter Michel** has been appointed general manager.

Continental Div., Ford Motor Co.— **L. E. Krieg** has been appointed assistant general manager; **N. E. Crisman,** manufacturing manager; and **William L. Wallace,** assistant to the general manager and the assistant general manager.

Fruehauf Trailer Co.—New executive vice-presidents are: **Wallace N. Barker,** railroad sales; **Frederick E. Burnham,** finance; **C. L. Schneider,** fleet sales; and **A. E. Williams,** engineering and manufacturing. New vice-presidents are: **Frederick S. Neumann,** sales; **Ernest Rackel,** manufacturing; **Edward A. Wheeler,** chief engineer; **A. L. Rich,** traffic; **Ernest L. Rushmer,** general attorney; **Richard E. Isaacson,** branch operations; and **Alex S. Aranyos,** foreign operations.

De Soto Div., Chrysler Corp. — **Vaughn E. Hayes** has been named master mechanic, replacing **W. B. Shimer,** now chief industrial engineer.

Ford Motor Co., Special Products Div. — **Allan Adams** was appointed quality control manager.

Dodge Div., Chrysler Corp.—**Raymond J. Russette** has been promoted to superintendent of planning.

Lincoln Div., Ford Motor Co.—**Norman F. Kroll** has been appointed quality control manager.

General Electric Co.—**George White** has been named general manager of the Atomic Power Equipment Dept.

E. F. Houghton & Co.—**Charles A. Biller** has been made manager of the Foreign Sales Dept.; **Armand J. Andre,** assistant sales manager of the Southern Div.; and **William Eismann,** acting research manager.

Ford Motor Co.—Robert H. Maguire was appointed chief stylist of a new staff advanced styling studio, and Joseph Oros succeeds him as chief stylist of the Ford styling studio in recent company shifts.

BullDog Electric Products Co. — **Perry M. Green, Jr.** has been named manager of Unit-Substations.

Erickson Tool Co.—**Harold Ruehl** is now chief engineer.

L. O. F. Glass Fibers Co.—**Donald L. McClure** has been named director of industrial relations.

National Motor Bearing Co., Inc. — Park Q. Wray, Jr., has been named vice-president of sales.

Fellows Gear Shaper Co.—**Edward W. Miller** has been elected president; **William H. Fellows,** clerk; and **Aldrien Carleton,** export manager.

Bendix Products Div., Bendix Aviation Corp.—**Russell E. MacKenzie** has been named executive engineer for the automotive products section.

Gar Wood Industries, Inc.—**Joseph R. Hager, Jr.** has been named director of manufacturing.

Ingersoll Steel Div., Borg-Warner Corp.—**Stephen L. Ingersoll** has been elected president and general manager.

Formsprag Co.—**Charles F. Trapp, Jr.** has been elected vice-president in charge of sales, and **L. T. Szady** has been elected vice-president in charge of engineering.

Elox Corp.—**Joseph Montgomery** is now general sales manager.

H. M. Harper Co.—**E. A. Channer** was elected vice-president.

Fellows Gear Shaper Co.—Edwin R. Fellows II was elected vice-president and general manager.

Gemmer Manufacturing Co.—**Henry L. Kaminski** was chosen manager of the Methods Development Dept.

Stratoflex, Inc.—**C. A. Thomas** has been appointed to general manager of sales.

Goodyear Tire & Rubber Co.—**John J. Hartz** is now development manager for all tire manufacturing divisions.

Illinois Tool Works—**O. Jules Poupitch** has been selected to head a new development program.

(*Turn to page* 188, *please*)

Necrology

William B. Stout, 76, pioneer automotive and aviation inventor and designer of the old Ford Tri-Motor plane, died March 20, at Phoenix, Ariz.

L. H. Moore, 52, owner or builder of five Indianapolis Race championship cars and Pontiac engineer, died March 25, at Atlanta, Ga.

William G. Sternberg, 69, former vice-president of the Sterling Div. of White Motor Co., died March 16, at Milwaukee, Wis.

R. A. Horner, a division manager of Barber-Colman Co., died recently, at Rochester, Minn.

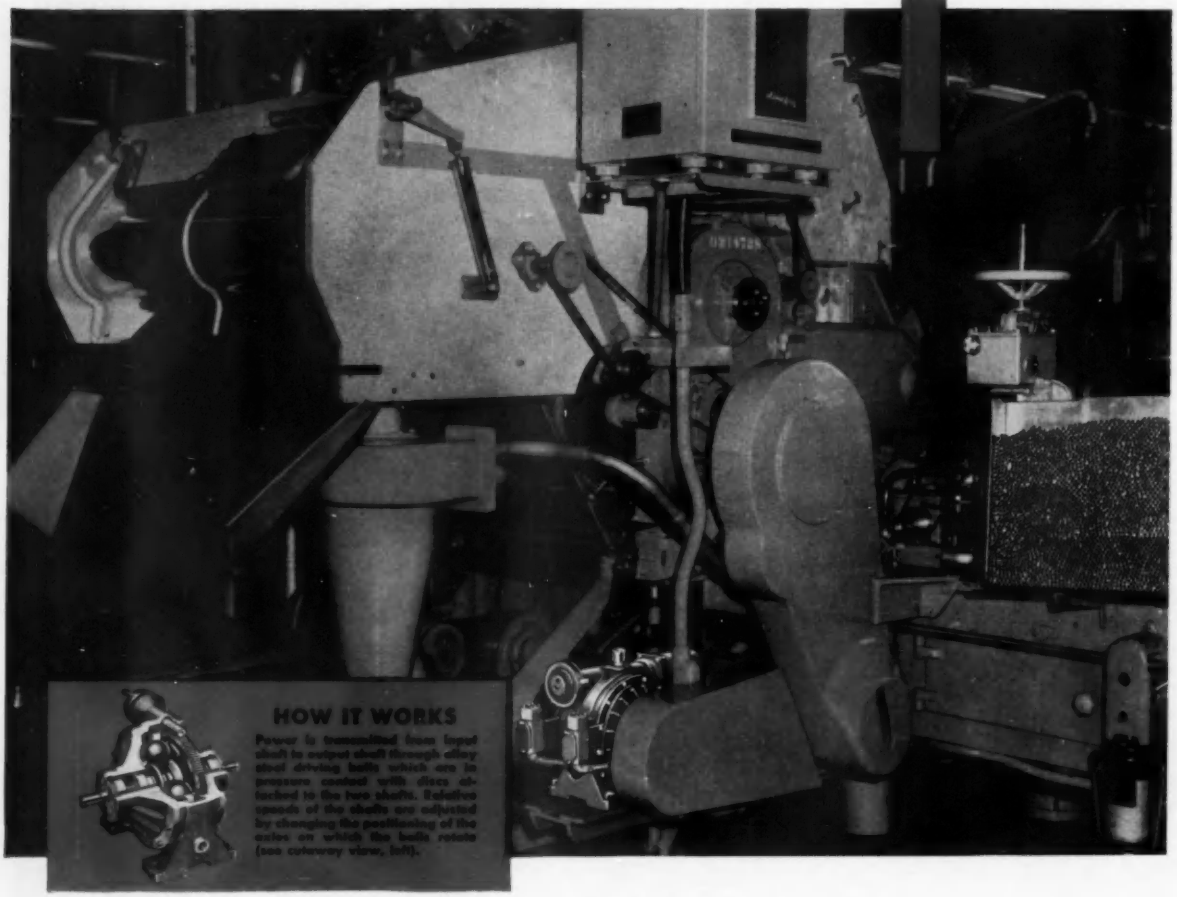
Everett H. Clark, 55, vice-president in charge of product engineering for International Packings Corp., died March 20, at Detroit, Mich.

Gen. W. L. Bell, Jr., 51, assistant chief of Army Ordnance, died March 19, at Washington, D. C.

Ralph DePalma, 73, widely known automobile race driver, died March 31, at Pasadena, Calif.

AccuRay electronic brain gets muscle power from Cleveland Speed Variator

The electronic control mechanism of this cigarette machine, known as the AccuRay cigarette gage controller, built by Industrial Nucleonics Corp., Columbus, Ohio, employs Cleveland Speed Variator size 4K4, driven at 1200 rpm input.



NATIONALLY famous for checking and controlling the making of Chesterfield cigarettes, AccuRay depends on a Cleveland Speed Variator for the delicate job of adjusting the tobacco feed rate in response to impulses from the gaging mechanism.

Being infinitely variable, the Cleveland Speed Variator gives stepless speeds over a full 9:1 range — from ⅓ to 3 times input speed. Output speed on this application is adjusted automatically by a regulating motor mounted on the Variator — but could be regulated manually or by remote controls of other types.

Available in eighteen standard types and sizes, the Cleveland Speed Variator offers these major advantages: 1. An extremely compact unit with input and output shafts in line and rotating in the same direction; 2. Almost any input speed up to 1800 rpm can be used — either clockwise or counterclockwise rotation; 3. Rated for constant horsepower output over a 9:1 range, or for constant output torque with a 6:1 range; 4. Infinitely variable over the entire speed range; 5. Rapid response to speed change, precise adjustment, and accurate maintenance of speed settings; 6. Long life and minimum maintenance due to absence of belts or complicated linkages; 7. Ample bearing support for overhung pulleys on either input or output shafts.

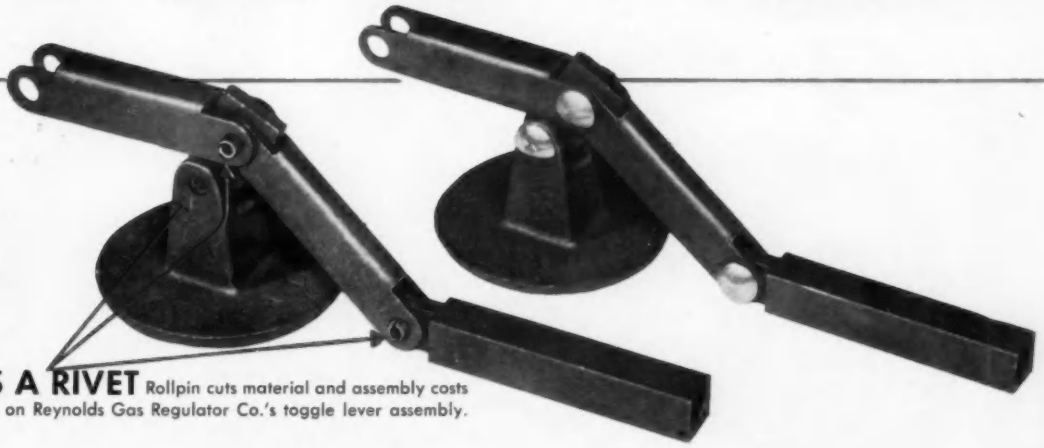
Write for Bulletin K-200 for detailed description with photographs, sectional drawings, rating tables and specifications.

THE CLEVELAND WORM AND GEAR COMPANY

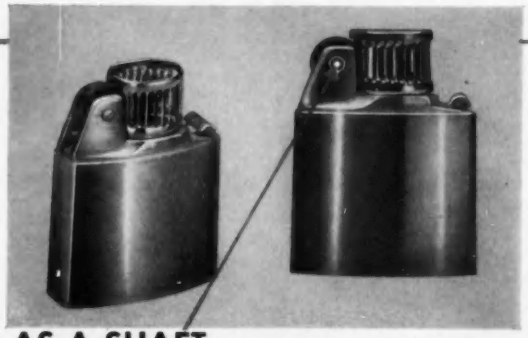
Speed Variator Division, 3274 East 80th Street, Cleveland 4, Ohio

Sales Representatives in all major industrial markets • In Canada — Peacock Brothers Limited

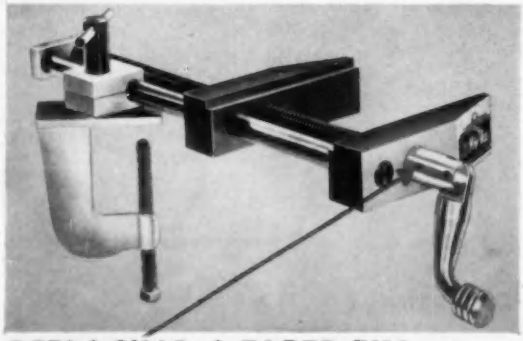
Three typical Rollpin cost reductions



AS A RIVET Rollpin cuts material and assembly costs 25% on Reynolds Gas Regulator Co.'s toggle lever assembly.



AS A SHAFT before and after shot of this Ronson lighter shows how Rollpin made savings of 1½¢ per unit in assembly of spark wheel.



REPLACING A TAPER PIN Rollpin saves 24¢ labor cost on each of American Machine and Foundry's MITY-7-VISES. Eliminates tool cost caused by breakage of small taper reamers.

ESNA TRADE MARK

ROLLPIN TRADEMARK

Where can you use this simple fastener?

If you use locating dowels, hinge pins, rivets, set screws—or straight, knurled, tapered or cotter type pins—Rollpin can cut your production and maintenance costs as it does in every class of industry. Rollpin is a slotted tubular steel pin with chamfered ends that drives easily into standard holes, compressing as driven. Its spring action locks it in place—withstanding impact loading, stress reversals and severe vibration. No threading, peening or precision drilling needed. Rollpin is readily removable and can be re-used in the same hole.

ELASTIC STOP NUT CORPORATION OF AMERICA

MAIL COUPON FOR DESIGN INFORMATION

Elastic Stop Nut Corporation of America
Dept. R38-45, 2330 Vauxhall Road, Union, N. J.

Please send the following fastener information:

☐ **Rollpin samples**
☐ **Rollpin bulletin**
☐ **Here is a drawing of our product. What self-locking fastener would you suggest?**

Name_____ **Title**_____

Firm_____

Street_____ **Zone**___ **State**_____

United Specialties Company

Air Cleaner Headquarters for the Tractor Industry

Throughout the entire range of tractor and allied farm equipment — from small walk-behind power cultivators to the giant diesel crawlers — United offers an oil bath air cleaner to fit the need. Today over 260 United Air Cleaner models are protecting millions of internal combustion engines in every type of operation — tractors, trucks, farm machines, passenger cars, busses, stationary and portable power units.

With newly expanded facilities in three modern plants, United Specialties Company is equipped to provide the newest and best in specialized automotive products. These facilities were added to meet increased normal requirements. They can serve you equally well for your special emergency commitments. We invite your inquiry.

UNITED SPECIALTIES COMPANY

CHICAGO 28 • PHILADELPHIA 36 • BIRMINGHAM 11

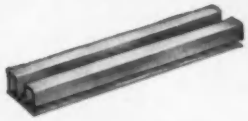
New rectangular oil bath air cleaner on diesel engines was created by United Specialties to better utilize limited under-the-hood space — provide more room for other accessories.

Special dual intake United Oil Bath Air Cleaner designed for use with dual carburetor. With one fixed and one eccentric fitting, this design provides a perfect air cleaner connection to both carburetors.

Special chaff precleaner attaches to regular oil bath air cleaner and removes bulk of dust and linty materials from air before it enters oil bath filter unit.

Gasoline engines used on tractors, combines and other agricultural implements are protected by this standard type United Oil Bath Air Cleaner.

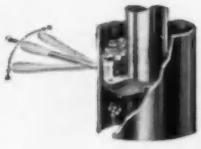
This air cleaner protects diesel engines in truck, tractor and industrial power units.



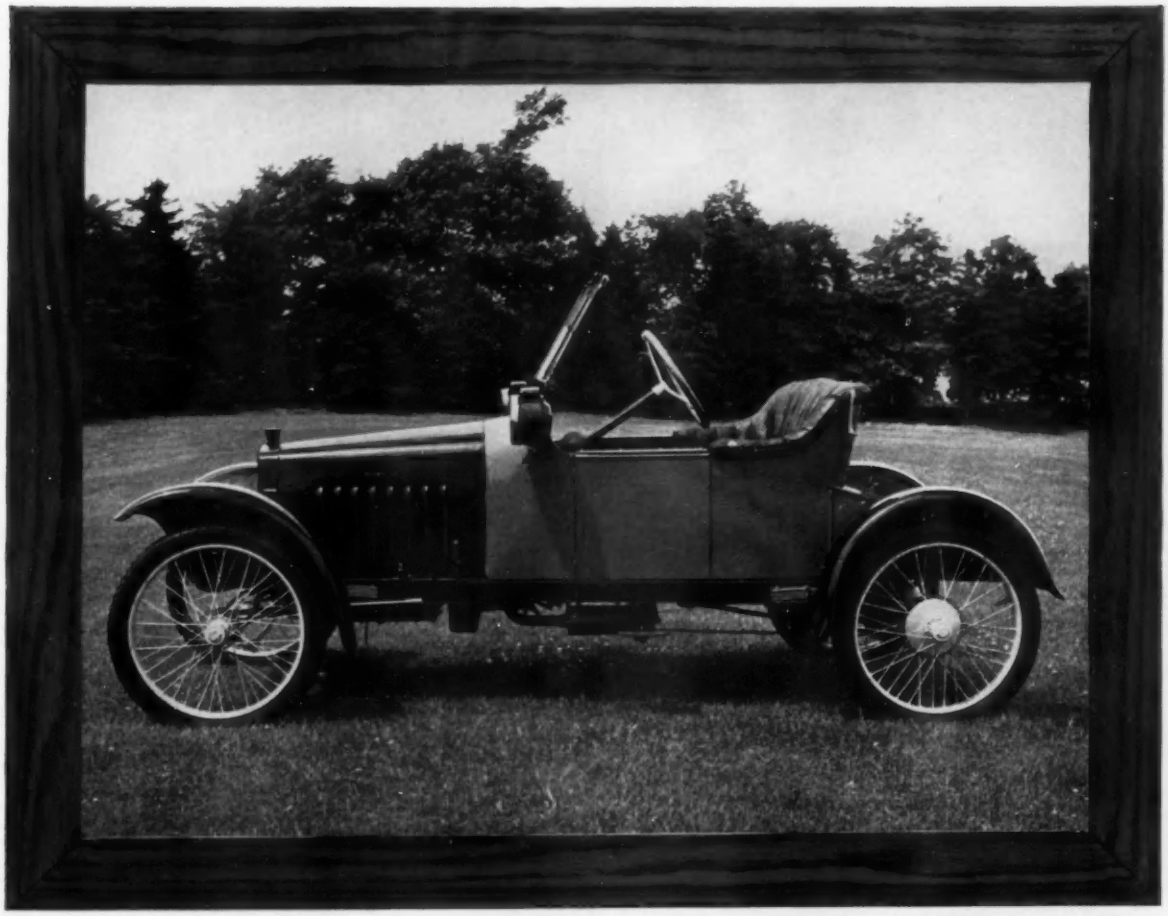
Complete range of metal shapes; cold-rolled, drawn and pressed.

Conventional-type Mitchell ignition switch used on popular makes of cars and trucks.

Mitchell clamp-on, screw-type, semi-automatic turn signal switch used in cars, trucks, busses.



Concealed-type turn signal switch. Signal is self-canceling.



Send for free print—1914 Saxon Runabout, Model A. Reprinted by permission—P. S. de Beaumont; not for commercial use.

At $395, the 1914 Model A Saxon Runabout was called "the poor man's light car." It had a 96-inch wheelbase, two-speed transmission, and featured standard tread wheels instead of the very narrow ones then in vogue on cyclecars.

This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free copy, suitable for framing. Morse Chain Company, 7601 Central Avenue, Detroit 10, Michigan.

18 out of 22 automobile manufacturers specify Morse Timing Chain Drives

Ever since mechanical horsepower began replacing nature's variety, the Morse Chain Company has supplied the auto industry with its precision-built Timing Chain Drives.

Fact is that today, eighteen out of the twenty-two automotive manufacturers using timing chains, actually *specify* Morse Chain Drives as original equipment.

More than 60,000,000 of these drives have already gone into cars, trucks, and buses—giving vehicle owners long service life, plus freedom from maintenance worries. Morse Timing Chains operate safely, quietly, and smoothly—with positive timing.

Investigate Morse Timing Chain Drives . . . and the other precision-built power transmission products which Morse manufactures. We have expert engineers always available to help you in your power transmission requirements. Write, wire, or phone us, today, for quick assistance on your particular problem.

MORSE CHAIN COMPANY: DETROIT, MICHIGAN; ITHACA, NEW YORK.

MORSE MORSE B-W •trademark **POWER TRANSMISSION PRODUCTS**

Lower Cost per piece with Surface Broaching of small parts

■ Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

■ In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching in many fields.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building

☆engineered for production

FOOTBURT

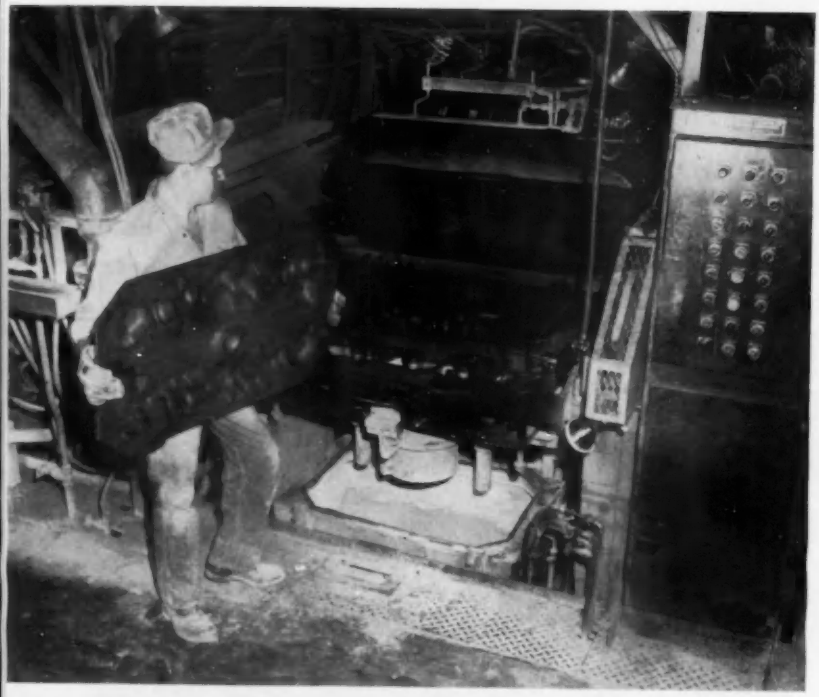
PIONEERS IN SURFACE BROACHING

Multiple sources for "Things" not called SPRINGS

Yours to put to work . . . . our mechanical ingenuity and craftsmanship . . . . experienced in producing an infinite variety of metal parts in such fields as automation, communication, medical, electronics, safety devices, product development, etc. The capacity of ASC springmaking minds and machines is unlimited. Ask any Division to examine your sample or blueprint.

Divisions of

ASSOCIATED SPRING CORPORATION



Sutter shell making machines are employed for producing the cope and drag shells. The die seen here is preheated by means of electric heating elements bedded in the back side of the die. The shell mix is invested onto the heated die, then the shell is cured by means of an oven brought over it.

Mechanized Foundry Setup for *Shell-Cast*

This is the shell gluing operation. The cope shell is placed on the spring-loaded fixture and resin glue vibrated onto it. The drag shell then is placed over the cope and the two halves are securely bonded together.

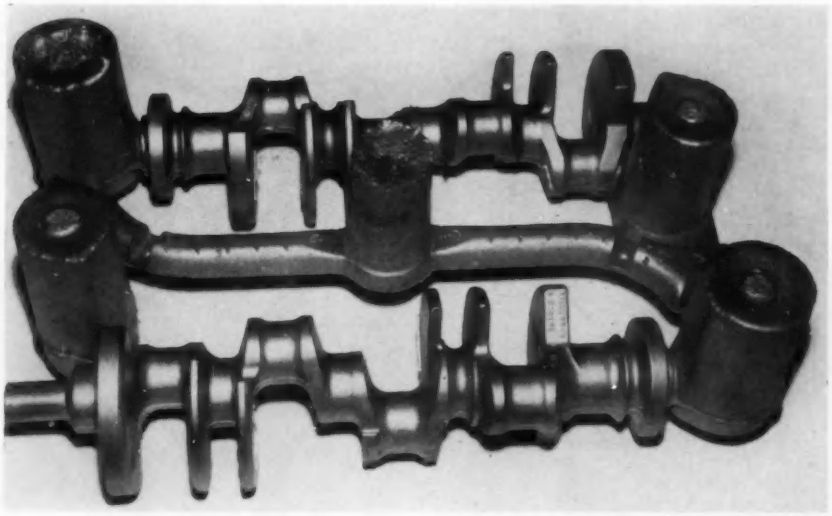
EARLY in March the Pontiac Motor Division, General Motors Corp., switched its crankshaft machining department entirely to the machining of ArmaSteel, shell-cast crankshafts and became the first GM passenger car division to use cast crankshafts exclusively. The crankshafts are supplied by Danville (Ill.) foundry of the Central Foundry Division of GM.

The first mass production shell-molding foundry to be opened for press inspection, the Danville foundry represents the most advanced operation of its kind, and features mechanization and automatic handling previously associated only with the newest manufacturing plants.

Although termed ArmaSteel, the CFD identification for pearlitic malleable iron, the composition employed for Pontiac crankshafts is modified by alloy additions developed and patented by the General Motors Research Staff. This modification was found necessary to develop the desired physical properties and economy in castings as large as crankshafts. The modifications entail amazingly minute amounts of alloying elements —only two parts in 10,000 of bismuth; and four parts in 100,000 of boron. A. F. Boegehold of the GM Technical Center explained that the function of the bismuth addition was to assure the combining of all carbon with iron in the preparation of white iron in the larger cross-section; while the minute percentage of boron the instrumental in reducing the annealing time.

According to Pontiac, the ArmaSteel crankshaft not only is fully equivalent to the former forged crankshaft from the standpoint of physical properties but is superior in some respects; and is greatly superior from the standpoint of machinability. On turning operations where high-speed-steel tooling was formerly employed it was found feasible to use c-t-c tools with an improvement in tool life of the order of 10 to 1. Where c-t-c tooling was formerly employed the improvement in tool life is of the order of 4 to 1. In addition, the closer tolerances and absence of forging draft have eliminated the counterweight cheeking operation formerly required, thus permitting an increase in cutting speed and feed on the crankshaft turning equipment.

Another important production economy stems from



Pontiac crankshafts are molded two at a time, using what is termed "two-on" gating. They are molded and poured horizontally. The sprues of both ends are knocked off automatically by an ingenious air-operated mechanism.

By Joseph Geschelin

Pontiac Crankshafts

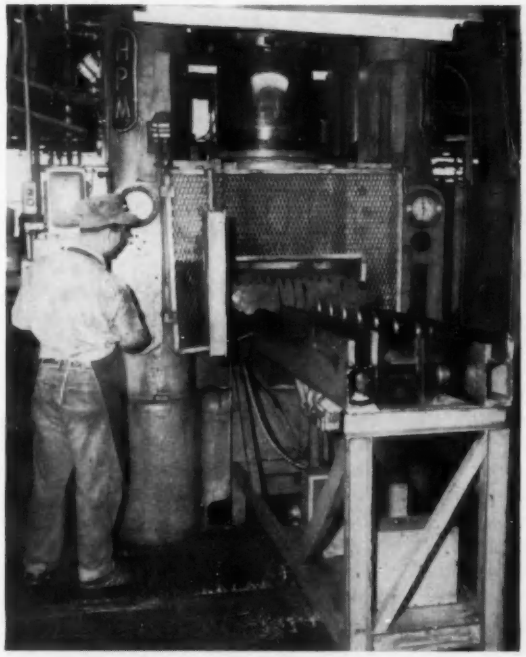
the ease of drilling the variety of oil holes. On the cast crankshaft it is no longer necessary to employ special torque-controlled or step-by-step drilling of small diameter holes. Too, Pontiac management was agreeably surprised with the ease of grinding the cast material as well as the excellent surface produced by finish grinding.

These are not the only features of production economy. The former forged shaft had a rough weight of 76 lb and a machined weight of 58 lb, resulting in 18 lb of scrap and chips. The cast crankshaft, on the other hand, weighs but 64 lb rough, and has a finished weight of 54 lb, resulting in only 10 lb of scrap. Not only does the new crankshaft require eight pounds less metal removal, it also saves a total of 12 lb of rough weight material to be handled and shipped.

As mentioned earlier, the Danville foundry is the most highly mechanized operation of its kind, employing advanced shell molding techniques. The management has succeeded in reducing to the minimum the physical effort on the part of operators and has established an exceptionally fine record of quality control through excellent housekeeping methods, good lighting, and outstanding working conditions by supplying clean, fresh air throughout.

Consider now a sampling of some of the methods employed in this operation. In the first place, note that castings are molded and poured horizontally, with two crankshafts to a mold, using the two-on gating illustrated here.

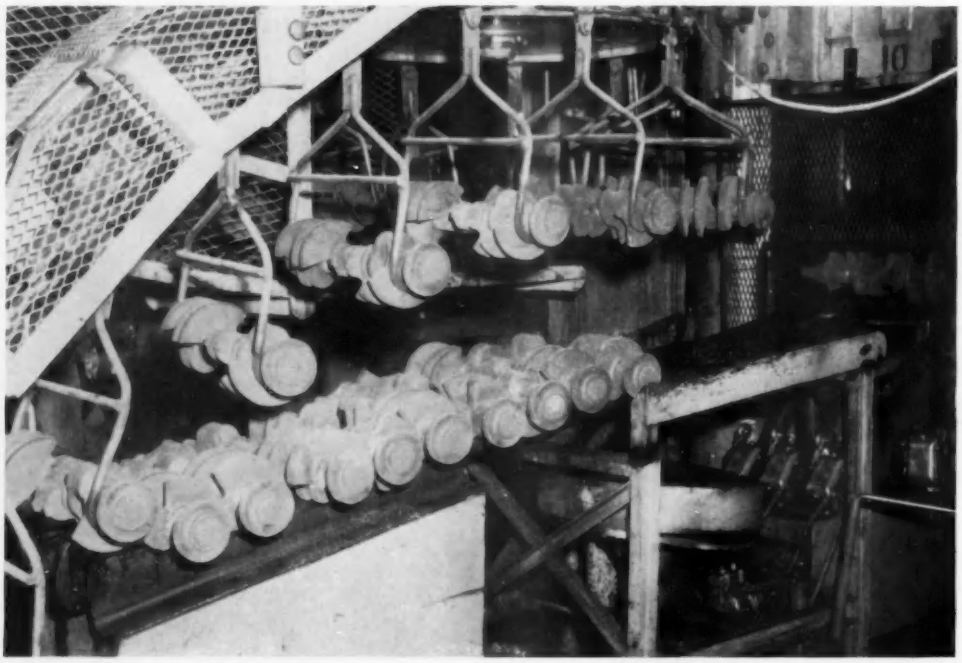
The cope and drag sections of the shell mold are prepared in the familiar Sutter molding machines, as illustrated, using a mixture of sand and resin which is invested onto the preheated metal pattern. After investment, the pattern is enveloped by an oven—while



As crankshafts leave the draw furnace of the annealing cycle they are transported to one of a battery of H-P-M hydraulic presses for straightening. They enter the press at a temperature of 1000 F, enter the die automatically, and are pressed for straightening. The transfer conveyor then automatically rolls the work 90 deg to present another section for pressing

in the Sutter machine—for curing. After the cope and drag molds have been stripped from the patterns, they are brought together in the shell gluing machine. Here resin glue is vibrated on the cope shell, the drag shell is placed on the cope and the two squeezed together.

Another distinctive development at Danville is the elimination of costly and time-consuming methods of backing up the shell molds for pouring. The shells



Crankshafts are ejected automatically from the rear of the press at the right and roll down the track as shown. The cooling conveyor hooks then reach the end shaft and pick it up automatically. The conveyor transports the work outside the building for cooling in the atmosphere.

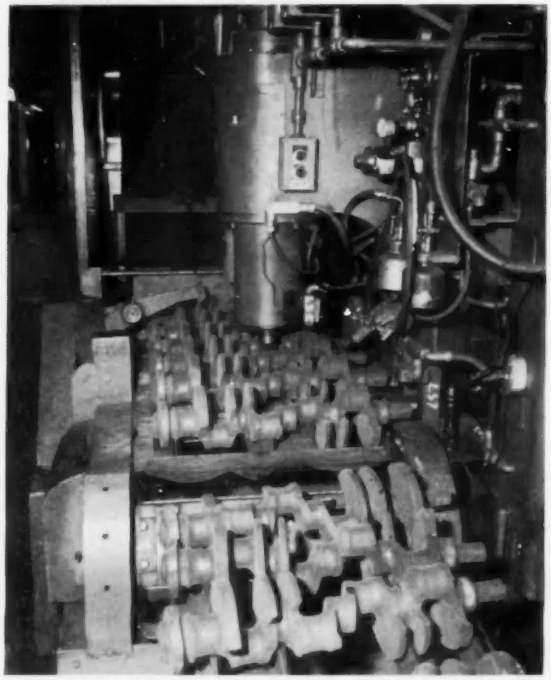
simply are placed on a sheet metal trough which is transported on the mechanized conveyor, the trough being filled with molding sand for level support. Then the upper face of the mold is covered with sand and the mold is ready for pouring. Each mold is filled with 300 lb of iron as the pouring conveyor moves past the pouring escalator.

An ingenious air-operated device is arranged to knock off the end sprues before knock-out. Following knock-out the castings are packed in individual alloy cradles to minimize warpage and the cradles placed on a three-tray dispatch carrier for transfer to the annealing kilns. The malleablizing cycle, taking about 32 hours, includes a cycle in the kiln, an air quench, and drawing.

Following drawing, the crankshafts are removed from the annealing cradles by means of a manually-operated, electrically-powered carrier and is transferred to the straightening operation while at a temperature of 1000 F. As illustrated, H-P-M hydraulic presses are used for this purpose. The transfer conveyor automatically feeds work into the press die, the part is pressed, then it is rolled 90-deg in the straightening die and pressed again, then automatically ejected.

Another typical example of automatic handling is the transfer from the press to the cooling conveyor. As the crankshaft is ejected, it rolls down the rails and is positioned for automatic pick-up by the conveyor hook as illustrated. The cooling conveyor carries the parts outside the building for cooling in the atmosphere.

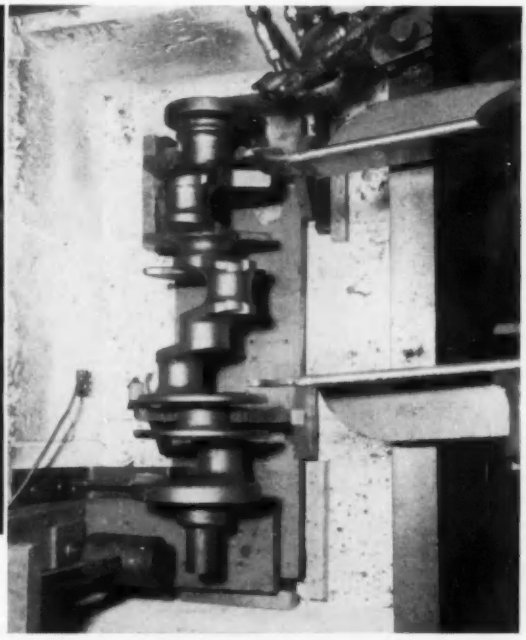
On its return trip the cooling conveyor unloads the work automatically into a Cogan Brinell hardness testing machine which also operates automatically. As the crankshaft enters the work station it is engaged by a



On its return trip the cooling conveyor automatically unloads shafts to the transfer conveyor serving the Cogan Brinell hardness testing machine. A grinding head, mounted just behind the hardness testing head, grinds a spot for inspection.

vertical grinding head which grinds a spot in a predetermined location. The hardness gaging head then engages this spot and makes the reading. If the read-

Following hardness inspection is a battery of special Sundstrand machines, one of which is seen here. The rear station has two large milling cutters for milling the ends to length; the front station centers both ends.



Crankshafts are mounted vertically on a merry-go-round conveyor mechanism for transport through Magnaglo inspection. As they leave the inspection booth, the shafts enter a sonic inspection chamber seen in this view. The hammer at the base is tripped, striking the end of the shaft. The tone is measured electronically and if it lies within the proper range, the spray gun seen at the top end squirts a dye to indicate acceptance.

ing is within the acceptable range, a spray gun automatically coats one end of the shaft with color.

From the Cogan machine crankshafts are transported to a battery of special Sundstrand machines combining milling heads at one station to mill the ends to length, and a centering station in front to center the ends.

Crankshafts then are hung vertically on a compact merry-go-round conveyor. Here the first stage is a dip into a tank containing a Magnaflux magnetic particle solution, then transport through a Magnaglo inspection booth for visual inspection designed to locate surface imperfections. As the work leaves the Magnaglo booth it is lowered into the sonic test chamber. Here a hammer at the base is tripped automatically, striking the crankshaft. The frequency of the tone is measured electronically and, if it is within the specified range, dye is sprayed on one end of the crankshaft to denote acceptance.

At the present time the foundry leaves about 0.1 in. of metal on a side for machining. Obviously, as more experience is gained it may be possible to reduce this allowance, thus further reducing the amount of metal to be removed by cutting. According to J. H. Smith, Central Foundry Division general manager, in addition to the production economies mentioned earlier, major advantages of shell-cast crankshafts include: good dimensional control; use of non-critical materials; and lower overall cost to the customer. From an engineering standpoint, the shell-cast technique also has important advantages to the engineers since it makes possible the production of crankshafts of intricate formations which are not practical in a forging.

Canadian Car Production Expected to Soar Shortly

Within the next five years automobile production in Canada will average close to 475,000 cars a year. By 1980 there will be 9.2 million cars on Canadian roads, compared to 3.755 million today, according to Rhys M. Sale, president of Ford Motor Co. of Canada Ltd., Toronto.

While there would only be slow rise in the number of cars produced and sold in the next five years, Mr. Sale stated that the increase would be faster after 1960. By 1980 there would be one car for every three Canadians, compared to the present ratio of one to every 4.2 Canadians, he said.

Mexico Shown As Sizable Market For Automotive Vehicles, Parts

Mexican imports of automotive vehicles and parts in the five-year period from 1950 through 1955 have averaged $64 million annually, according to the latest available figures. In 1926, Mexico had only 53,000 vehicles, but today there is a total of 452,000 units of all types in the country.

Fifteen automotive assembly plants are now to be found in Mexico. Ten of these are in Mexico City, two in Monterrey, and one each in the cities of Puebla, Saltillo, and Mazatlan. These operations represent a total investment of around $12 million.

Only approximately six per cent of the total number of replacement parts are fabricated nationally, while the remainder are imported. Industry officials are anxious to improve this ratio, especially in the production of tools, seat materials, carburetors, radiators, wheels, bumpers, etc., as a means of reducing their prices and the heavy volume of imports.

ASTE's Largest Tool Show

By Charles A. Weinert

A MAMMOTH and comprehensive program, literally following the theme "Tooling for Tomorrow," was presented by the American Society of Tool Engineers at its 24th Annual Convention and 1956 Industrial Exposition held in Chicago's International Amphitheatre last month. Attendance exceeded 36,000.

Production tooling and methods, automation, the working of titanium, and the machining of cermets were among the variety of subjects covered by the grand total of 61 technical papers presented in the 27 industrial conferences. A complete shaped-diamond-tool symposium, co-sponsored by the Armour Research Foundation of the Illinois Institute of Technology, entailed 13 of the papers in five different sessions. Solving carbide die problems was the general subject of a session co-sponsored by the National Tool & Die Manufacturers Assn. The National Fluid Power Assn. co-sponsored a conference on fluid power for the tool engineer.

Called the biggest "tool show" in history, the exposition comprised 535 exhibitors and was spread over a 7½-acre display area. Newest types of machine tools, cutting tools, metal forming machines, testing instruments, and heat treating equipment, and latest developments in the production of diamond tools were included in the general categories of material exhibited and demonstrated. At show opening, revised estimated value of exhibited products was given as $14,275,000. The use of diamonds in industry was represented by over $4 million worth of man-made, gem and industrial diamonds shown in the exhibit.

Plant Inspection

An added attraction was the programming of 12 plant inspection visits, which were enthusiastically received and proved of considerable interest to many of those attending the convention. Visitations were made to Motorola, Inc.; U. S. Steel Corp.; Armour Research Foundation; Skil Corp.; Ford Aircraft Engine Div.; Scully-Jones & Co.; Hotpoint Co.; Kropp Forge Co.; International Harvester Co.; Electromotive Div., GMC; Sears, Roebuck & Co. testing laboratories; and Verson Allsteel Press Corp.

New Officers

Howard C. McMillen, plant manager of Philco Corp., is the newly elected president of the Society. He succeeds Dr. Harry B. Osborn, Jr., technical director of Tocco Div., Ohio Crankshaft Co. The other new officers are: first vice-president, H. E. Collins, Hughes Tool Co.; second vice-president, G. A. Goodwin, The Master Electric Co.; third vice-president, Wayne Ewing, Arrowsmith Tool & Die Co., Inc.; fourth vice-president, H. Dale Long, Scully-Jones & Co.; treasurer, John X. Ryneska, General Electric Co.; and secretary, William Moreland, Meyers Pump Co. The new officers were installed at the annual meeting banquet held in the Grand Ballroom, Conrad Hilton Hotel, on Thursday, March 22.

Industrial Research

Principal speaker at the banquet was David Swan, director of research, Metals Research Laboratories, Electro Metallurgical Co., a division of Union Carbide & Carbon Co. He spoke on the subject of "The Impact of Industrial Research." Pointing out that our national research effort has reached the size of a major industry, he mentioned that the United States is now spending about $5 billion annually, two-thirds of which is spent in industrial research laboratories. He said that the amount of capital which must be invested as a result of successful research effort is between five and 20 times the amount of industrial research itself; and that this combination of research and capital investment has perhaps been one of the largest single factors contributing to the general prosperity in our country. He concluded that in its short history, industrial research has demonstrated a tremendous impact and that it appears likely this will be increased even further during the next generation.

Awards

James H. Kindelberger, chairman of North American Aviation, Inc., received the 1956 ASTE Progress Award for "life-long leadership in the development of civilian and military aviation, for exceptional ability in designing aircraft for fastest, simplest manufacture and for inspiring collaboration in aircraft technology."

Orlan W. Boston, professor and chairman, department of production engineering, University of Michigan, was given the Gold Medal Award for "his work as an eminent educator in production engineering and for his influential advocation of the importance of tool engineering in the national economy."

Edward W. Ernst, machine tool specialist, Major Appliance Div., General Electric Co., received the Joseph A. Siegel Memorial Award for "his contributions to the Society's growth and prestige and for his diligent work in establishing sound policy and effective standardization practice."

New officers and past president of the American Society of Tool Engineers are, left to right: (seated) Wayne Ewing, third vice president; Howard C. McMillen, president; H. E. Collins, first vice president; G. A. Goodwin, second vice president; (standing) Dr. H. B. Osborn, past president; William Moreland, secretary; and H. Dale Long, fourth vice president. (Not shown: John X. Ryneska, treasurer.)

Ralph E. Cross, executive vice president, Cross Co., was awarded the Engineering Citation, given for unusual skill in the development of tool engineering principles. "As a pioneer and consistent leader in the development and application of automation principles to machine tools and manufacturing processes, Cross (received) this award for his many contributions to his country's peacetime industrial progress and national defense by sound counsel and service."

Exhibits

Some of the new developments on display at the exposition were previewed in AUTOMOTIVE INDUSTRIES, March 1, beginning on page 55. Representative of the many others worthy of special note are the following:

Tocco Div., Ohio Crankshaft Co., displayed for the first time an automatic thread annealer for ball studs, of 30 kw capacity. Production rate is on the order of 3000 to 4000 pieces per hour. The machine is fully automated, including conveyors feeding to and from the unit.

Crane Packing Co. showed a diamond setting fixture designed for lapping silicon and germanium wafers. Tolerances can reportedly be held to within ± 0.0001-in.

In the W. H. Nichols Co. booth was the new Twin Mill, a two-spindle miller designed for simultaneous milling of opposite or adjacent surfaces, horizontally or vertically. The machine is push-button controlled and arranged for automatic table cyling.

Taylor Dynamometer & Machine Co. presented a new air control for its precision drilling machine which has a hole drilling range of from 0.001 to $\frac{1}{8}$-in. and a speed range of from 800 to 10,000 rpm.

Cincinnati Milling Machine Co. showed for the first time one of its new line of high frequency induction hardening machines which was tooled up to harden hollow thin-walled turbine shafts. The machine features a high frequency range of 1200 to 1400 kc, which is said to permit rapid surface hardening of parts requiring shallow case depth and very narrow transition zones between case and core.

A 200-ton platen press for metal forming and drawing was introduced by Rodgers Hydraulic, Inc. Also displayed was a plastic molding press of 50-tons capacity. Tonnages in the line range from 50 to 400, and platen sizes from 18 by 18-in. to 48 by 72-in.

The Torrington Co. showed its modernized models of rotary swaging machines incorporating engineering and design improvements. The streamlined series is available in nine different models.

Swanson Tool & Machine Products, Inc., had in operation a line of standard indexing machine chassis. Included was the new Series K heavy-duty index chassis available in turret diameters up to 72-in.; and the Series L Auto-Tran straight line transfer machine chassis that can be furnished with 36 to 72 work carriers.

An instrument for automatically inspecting pinions for quality, to indicate excessive errors and to sort gears which are outside predetermined limits, was exhibited by Fellows Gear Shaper Co. When included in an automated production line it will monitor the machine which is cutting or finishing the gear pinions.

A typical model of automatic multi-head riveters was demonstrated by Tubular Rivet & Stud Co. Components to be joined are placed in a work-holding fixture by the operator, and the rivets are automatically fed and simultaneously set in each cycle.

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East German Automotive Growth Reflected at Leipzig Fair

By David Scott

LEIPZIG, EAST GERMANY—The East German automotive industry has set itself the task of increasing output to serious levels by limiting the variety of models, stabilizing designs and introducing more automation and mass production methods. Until very recently vehicle manufacture has been held back while heavy industry got top priority and expanded rapidly, particularly in the engineering sector.

But now, with a substantial new capacity in locally-produced machine tools and steel, East Germany is seeking to turn out greater quantities of cars, trucks and tractors, and these to a higher standard.

Nationalized factories in this area are being groomed as major suppliers to the rest of the Communist bloc, where road transport is still highly inadequate. At the same time, vehicles will become a more prominent export article to non-Communist markets, and take a larger part in East Germany's foreign trade program, since much closer economic relations with the outside world—especially Asia and the Middle East—are planned for the future.

The revived Horch passenger car, the Sachsenring P240, has an 80 hp six-cylinder engine with overhead valves. Ventilation ducts with heater units are built into the front fenders.

All-plastic body of the Zwickau P70 has 0.12 in. molded panels. The rear seat backrest folds forward to give access to the trunk.

The current program calls for the production of only three models of cars: the Horch P240, Wartburg 311, and Zwickau P70. Truck manufacture will concentrate on the one-ton Framo, 2½-ton Phaenomen and 3½-ton Horch. All basic chassis will be available with numerous body types, but trucks larger than six tons will not be made after 1957, as all such requirements are to be covered by imports. Tractor production is to be likewise nationalized.

The first fruits of this new policy were seen at the Leipzig Fair in March. The Horch P240, the first passenger car to bear that name in many years, is clearly designed for foreign sales. Named the Sachsenring, it is a roomy six-passenger, four-door sedan with large glass area and modern styling. The six-cylinder engine of 147 cu in. displacement develops 80 hp at 4250 rpm. In this unit, overhead valves and a compression ratio as high as 7.1 to 1, make their first postwar appearance in an East German gasoline engine as a result of the 75 octane fuel now available. Sixty octane was universal until very recently.

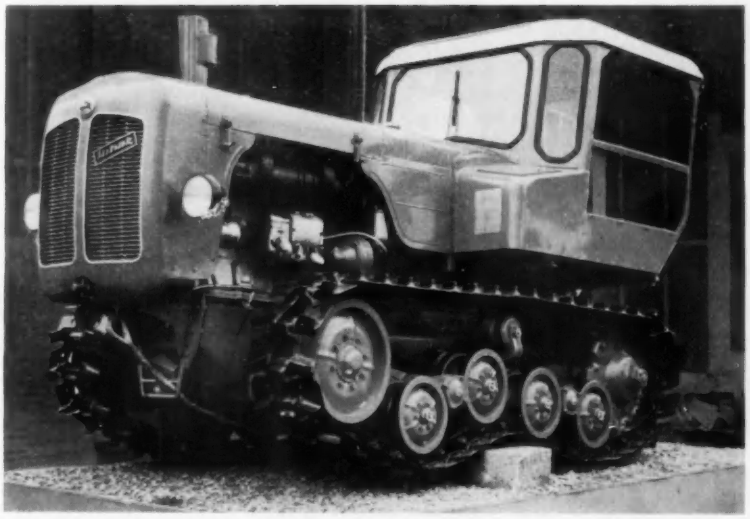
The four-speed transmission has synchromesh on the top three ratios, and hydraulic clutch and

Two-stroke engine of the East German Wartburg is in unit with the gearbox and differential which drives the front wheels. The rear-mounted radiator has fins of its upper third closely spaced to concentrate heat dissipation in the area covered by the air scoop for interior ventilation.

brake have pendant pedals. Wheelbase is 110 in., overall length 186 in., and width 70 in. Tires are 7.10-15, and the high ground clearance of 8.4 in. suggests attention to overseas driving conditions and unpaved roads.

Twin ventilators and hot water heaters are built into the two front fenders, with air flow controllable individually for each of the four corners of the body.

The Wartburg 311, unveiled at Brussels, was exhibited at Leipzig in refined form. Longer and more spacious than the IFA F9 which it will supersede, it now more closely rivals the West German DKW, with which all family connections have been severed by



East German Urtrak KS 30 has articulated bogies instead of the former rigid assembly, and a longer track than the model it replaces. Engine is a 63 hp Diesel.

the Iron Curtain. The three-cylinder, two-stroke engine driving the front wheels is retained with a few modifications, although a new differential is used and the gear-shift lever for the four - speed, non - synchromesh transmission has been moved to the steering column.

The heater, taking in warm air through the radiator which is behind the engine, now incorporates a blower and small hot water radiator in the duct. Fins on the upper third of the main radiator which faces the air

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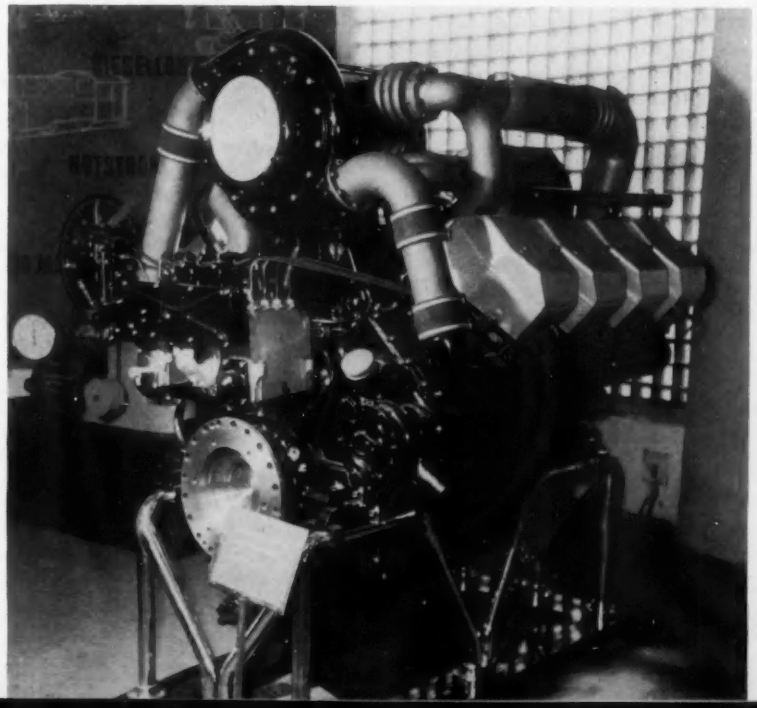

Supercharged V-8 Diesel from East Germany develops 600 hp at 1500 rpm. The supercharger is exhaust-driven.

Power Augmentation with Nitromethane

By E. E. Starkman, University of California
E. S. Moulic, Shell Development Co., and
M. Dunn, Chrysler Corp.

For the last ten years nitromethane has been known on the dirt tracks and drag strips as the "poor man's supercharger." This label resulted from an ability to increase the output of a racing engine with no expensive mechanical attachments. There is also strong indication that for the last three years it has helped the "not-so-poor man" at the Indianapolis "500." But with all this application, little if any information is available on specific performance figures or on the mechanism by which the material functions. The purpose of this paper is to report on the results of the initial phases of a continuing systematic investigation on the engine application of nitromethane; an investigation that also, incidentally, includes other nitroparaffins.

Nitromethane (CH_3NO_2) is 52½ per cent oxygen by weight. This fact may partially explain why it has acquired the name, "poor man's supercharger." Since it does contain so much oxygen, it is a promising rocket engine fuel, to be used as a monopropellant, and, in the rocket field, Zwicky and Ross[1] and Klein[2], among others, describe such use. Albright, Nelson and Raymond[3] report on its application as a diesel fuel cetane improver and there are a number of papers available on applications in the paint, solvent and chemical industries[4, 5, 6]. Information on the use of nitromethane in spark ignition engines is sparse and usually is only an incidental item in a paper on racing or racing engines. Two such references are Brown[7] and Jackson[8].

Word of mouth reports dating back more than 10 years account for almost all that is additionally known about nitromethane in spark ignition engines. The early verbal reports concerned the performance improvements to be obtained from using nitromethane in admixture to model automobile, boat and airplane fuels. The amount of additive and blending techniques were very carefully kept secrets and the increased performance was generally unbelievable. Later applications to "drag" racing were disclosed, but again the information was of a vague nature, except for the reported incidence of broken crankshafts and burned pistons which seemed to accompany the inclusion of nitromethane in the fuel and were the circumstantial evidence of its overapplication.

The work reported here was undertaken for three purposes. First, it was desired to learn if under controlled laboratory conditions the fuel additive was really as effective as the reports indicated. Second, if such performance was confirmed, the extent or magnitude of the improvement was to be determined as a function of a number of engine variables, and third, an attempt was to be made to establish the mechanism by which such improvement was obtained.

Fuel Properties and Blending

Nitromethane is a clear colorless liquid of molecular weight 61. It has a density of 1.139 at 20/20 C.[9] and a gross heating value of 5000 Btu per lb[1]. It is only slightly soluble in aliphatic hydrocarbons, more soluble in aromatics, and very soluble in the lighter alcohols. If subjected to shock, it has a tendency to decompose with considerable violence, and to explode in the manner of certain other organic nitrogen compounds (tri-nitro-toluene being a good example). The degree of shock is apparently quite high, since it may be shipped labeled only as a combustible, and not as an explosive material, according to the Bureau of Explosives of the American Association of Railroads[10]. The magnitude of shock necessary and the conditions under which subsequent explosion might occur is not agreed upon, even by the experts. It is toxic only to the extent of such materials as petroleum naphtha or methyl isobutyl ketone, or in concentrations greater than 100 ppm in air[11]. Thus, nitromethane is relatively safe to handle, using reasonable precautions, especially when diluted in alcohol or hydrocarbon fuel.

The amount of oxygen contained in the Nitromethane molecule is not so important as is its bonding before and after the combustion reaction. As example, the oxygen in water has little energy value in admixture to a fuel because it is already in the lowest energy form to which it can be reasonably subjected by combustion. Therefore, water cannot be expected to provide oxygen enrichment. In the case of nitromethane, the fuel contained oxygen is available. The degree to which such bonding energy can be used is a function of the composition of the products of combustion. This distribution is presently the subject of further study, but two limiting possibilities are suggested.

If the fuel is allowed to decompose by itself, with no oxygen from the atmosphere or elsewhere, such decomposition according to Klein[2] proceeds as follows:

$$4CH_3NO_2 \rightarrow CO_2 + 3CO + 3H_2O + 2N_2 + 3H_2$$

This would be the reaction when used as a monopropellant in a rocket, or if used in a piston engine without air. However, as presently used in piston engines, and if burned at chemically correct mixture ratio with air, the reaction, according to Powell[12] is likely to be:

$$4CH_3NO_2 + 3O_2 + 11.3N_2 \rightarrow 4CO_2 + 6H_2O + 13.3N_2$$

The chemically correct fuel-air ratio by weight for this reaction is 0.588. It can be recognized that this is quite a rich mixture ratio when compared to hydrocarbons, say isooctane (C_8H_{18}) which has a chemically correct fuel-air ratio of 0.0662. Even methyl alcohol, which must be burned very rich compared to hydrocarbon fuels, has a chemically correct fuel-air ratio of only 0.154. Thus the use of nitromethane, even as an additive in moderate concentration, necessitates a drastic change in fuel metering for

near correct mixtures. Figures 1 and 2 have been plotted to illustrate the change in air-fuel ratio necessary to retain a chemically correct mixture when nitromethane is added to a hydrocarbon fuel such as gasoline (Fig. 1) or methyl alcohol (Fig. 2).

The potentials for use of undiluted nitromethane for non air-breathing piston engines are obvious. Unfortunately, any attempt at this time to do so would probably lead to disaster. We are not quite yet ready to hazard the sacrifice of an engine to establish this point, especially since the dangers involved in such application has already been exemplified by the many rocket engine experiments which have come to an abrupt conclusion because of nitromethane's ability to become easily uncontrolled in combustion.

In a reciprocating engine this same tendency to becoming unstable with relatively little provocation at high temperatures and pressures leads to preignition. is is therefore presently limited to being used as an additive to other fuels. The concentration to be tolerated is indicated by preignition or knocking tendency, and this in turn is primarily a function of the engine operating conditions, combustion chamber configuration, and the composition of the fuel in which it is a constituent. It should be apparent that the fuel to which it is being added must, before dilution with nitromethane, be of relatively high anti-knock quality. It should also be apparent that keeping the engine cool is of primary importance. Reports are available of as much as 85 per cent concentration successfully being used in cold engines.

An additional restriction, caused by relative insolubility, pointed out previously, results in the necessity to use unorthodox blends, if hydrocarbon, or otherwise alcohol blends. (Nitromethane is only slightly soluble in gasoline, to the extent of no more than five per cent.) Thus, for this investigation, methyl alcohol was used as one base fuel and an equal volume benzene-isooctane blend used as another, with the concentration of nitromethane limited to that which would cause violent preignition.

Equipment

Two engines were used in this investigation. For the initial work a two cylinder, Lawrence Model 30D engine with horizontally opposed, air cooled cylinders and of 2⅝ in. bore and 2¾ in. stroke was available. This engine was rated at 10 hp at 4150 rpm. A Midwest eddy current dynamometer was used to absorb the output. As mixture distribution and acoustical problems were encountered in the carburetor and inlet manifold, research in this engine had to be abandoned in favor of a C.F.R. engine, even though it was felt initially that the high speed of the Lawrence engine might be important to the investigation, because it was suspected thta high flame speed was one beneficial effect of the nitromethane.

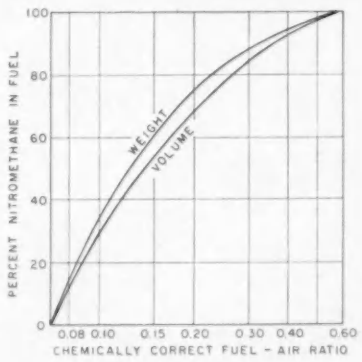

FIG. 1
Correct mixture ratios for nitromethane in hydrocarbon fuel

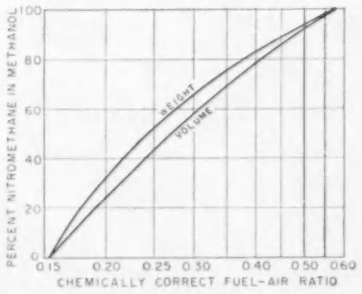

FIG. 2
Correct mixture ratios for nitromethane in methanol

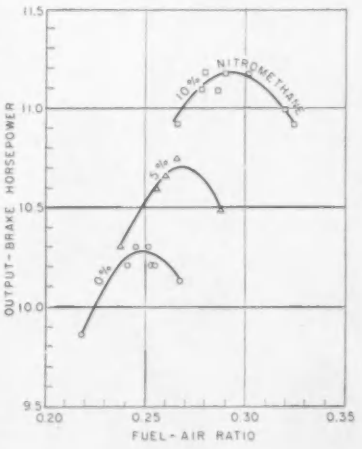

FIG. 3
Lawrence engine performance with nitromethane in methanol

A standard single cylinder supercharged CFR installation[12] was used as the second laboratory engine. The compression ratio was set at 6 to 1, which was felt to be a nominal value for purposes of primary performance comparisons. In all cases the manifold pressure was adjusted to 30.0 in. of mercury absolute, and the manifold air temperature 125 ±5 F.

Because the latent heat of the fuel blends differed, the density of the charge in the cylinder at the beginning of the compression stroke varied slightly and so did the air flow rate. This variation amounted to a maximum of ±2 per cent, hardly more than the least count of the instrumentation on the air metering orifice. Even then these air flow variations occurred primarily at the very rich mixtures and thus were of negligible significance.

Other than the above, the engine was operated in the normal fashion[12]. Engine speed was governed by the induction motor variance from 1800 rpm caused by engine load (±20 rpm). Jacket temperature at first was 375 F and later 150 F. Oil temperature was held to 165 ±5 F. Spark advance was maintained at 45 deg. btdc.

Results

Lawrence Engine Data

The effect of the fuel additive nitromethane was first determined by measuring full throttle brake horsepower as a function of air-fuel ratio at constant speed and spark advance in the Lawrence Engine. Methanol was used as the base fuel for reasons of its high solubility for nitromethane as compared to gasoline base fuels. Concentrations of 5, 10 and 15 per cent nitromethane by volume were tested.

Because of difficulties with preignition of the 15 per cent nitromethane concentration, which led ultimately to a piston failure, only data for the two lower content blends are shown in Fig. 3. These data are for 3500 rpm and they proved conclusively that nitromethane definitely had beneficial effects on power output even in this aircooled engine. These preliminary tests showed an increase in brake output of about ten per cent for a 10 per cent volume mixture of nitromethane in 90 per cent methanol. It should be remembered that the Law-

rence engine drives its own blower for cylinder cooling as well as many other auxiliaries. Thus the increased output reflects a low mechanical efficiency of the engine.

These early but conclusive results qualified further study. But the Lawrence engine was abandoned at this point because of the previously mentioned difficulties with the induction system and with piston failure; the latter being partly a result of preignition and partly of insufficient control of the temperature of the air cooled cylinder. In addition, the Lawrence installation allowed only net or brake output to be measured and the gross, or indicated, was desired. The research was therefore transferred to the C.F.R. installation.

C. F. R. Engine Data

Methyl Alcohol Base Fuel

Figure 4 is a direct plot of the indicated mean effective pressure as a function of fuel-air ratio, resulting from various concentrations of nitromethane blended in methly alcohol up to the preignition limited concentration of 20 per cent by volume at a very high jacket temperature of 375 F. With the methyl alcohol base fuel alone, maximum obtainable indicated mean effective pressure as shown was 142 psi. With 20 per cent nitromethane the maximum indicated mean effective pressure was 160 psi. It is also evident that the optimum power fuel-air ratio was changed from about 0.20 to about 0.30 lb fuel per lb air from the base fuel to the 20 per cent nitromethane blend.

As important a consideration as power output is the rate at which fuel will be consumed for any given situation. To best illustrate the manner in which fuel consumption is effected, the data of Fig. 4 have been replotted in Fig. 5 as fuel consumption loops, which show indicated specific fuel consumption as a function of indicated mean effective pressure. It can be seen that the minimum specific fuel consumption to be obtained is with no nitromethane in the fuel; a value of about 0.84 lb per indicated horsepower hour. With 20 per cent nitromethane the minimum specific fuel consumption increased to almost 1.0 pound of fuel per indicated horsepower hour. This 19 per cent increase in fuel consumption would be a considerable factor if the weight of fuel to be used is of any concern in a particular application. On a volume basis, this would be reduced to approximately 17 per cent increase in fuel consumption rate

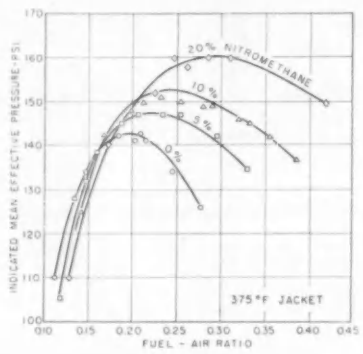

FIG. 4
CFR engine results with nitromethane in methanol

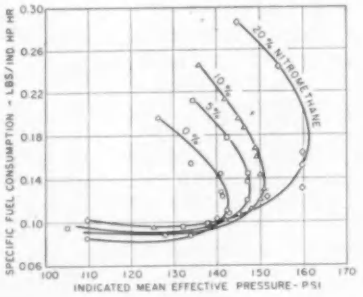

FIG. 5
Fuel consumption loops for nitromethane in methanol

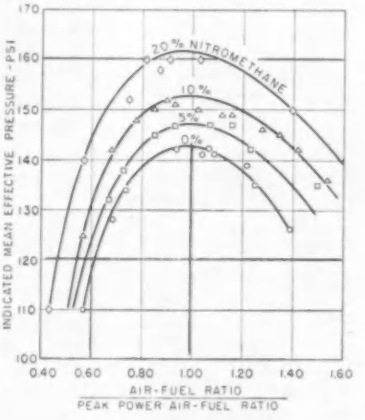

FIG. 6
Influence of mixture control on output

because of the greater density of the fuel with the additive.

Because of the shift to richer mixtures caused by the inclusion of nitromethane, it is profitable to view the results of Fig. 4 plotted as a function of per cent of optimum air-fuel ratio. This has been done in Figure 6. Replotting as shown gives a clearer picture of the influence of nitromethane and shows the increased latitude in mixture control which results, an additional advantage of the material.

The preignition encountered at 20 per cent concentration of nitromethane and 375 F jacket temperature was evidenced by a progressive loss of power which appeared at mixtures near chemically correct after a minute or two of operation at those fuel settings. Little audible knock was detected, but in certain cases power output fell to nothing in as little as 15 sec, even though at very rich and at lean mixture ratios, operation was perfectly satisfactory. The tendency for preignition was so pronounced at 20 per cent concentration that it was felt impractical to attempt to collect data at greater concentrations without lowering the jacket temperature. Therefore, as soon as it was realized that preignition was a limiting factor, the jacket temperature was lowered to 150 F and then it was possible to operate the engine on 40 per cent by volume of nitromethane in methanol with some success. Unfortunately this reduction in jacket temperature also changed the engine output for methanol alone, increasing this calibration or base value to 158 psi from 142 psi indicated mean effective pressure. Since the 150 F jacket results cannot be plotted conveniently with those of Figure 4, they are shown in Fig. 7. The dashed portions of the curve for 40 per cent is the region in which preignition power losses still made data difficult to obtain and questionable in value.

The peak power values in Figures 4 and 7 have been combined and replotted in Fig. 8. Even greater increases were found for 60 per cent volume nitromethane, obtained by adding water to the fuel to suppress preignition. These 60 per cent data were scattered and inconclusive, and are therefore not plotted along with the more reliable data shown. For the range of reliable data, the increased net output appears to be a linear function of nitromethane content and amounts to about 5 per cent increase per 10 per cent of the additive.

So far the results presented are based on the gross output, efficiency and specific fuel consumption. From a practical consideration friction must also be considered, especially for high speed engines. This varies widely and is a function of the engine.

For purposes of example, mechanical efficiency can be presumed to be about 75 per cent, a nominal figure for most reciprocating engines which would be likely to have a use for such a fuel additive as nitromethane. Since

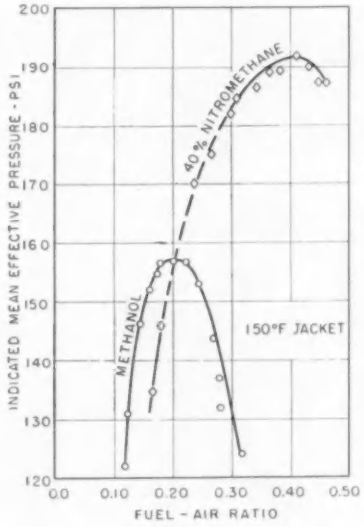

FIG. 7
CFR engine results with nitromethane in methanol, reduced jacket temperature

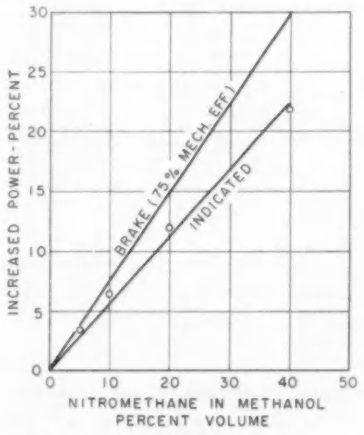

FIG. 8
Incremental power increase with nitromethane in methanol

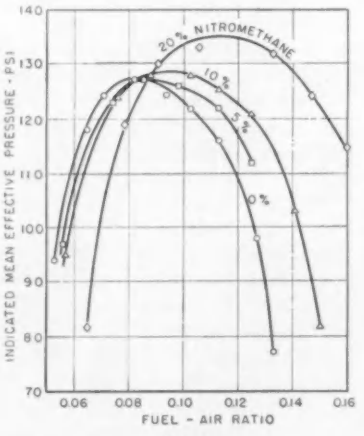

FIG. 9
Influence of nitromethane in hydrocarbon fuel on engine power

the addition of nitromethane would have little or no effect on friction horsepower in the engine in which it might be used, the increase to be found in net or brake output would be far greater percentagewise than the gross or indicated as shown, say, in Fig. 4 or 7. Brake output with this 75 per cent presumed mechanical efficiency has also been plotted in Fig. 8. The increased output at 40 per cent volume concentration of nitromethane turns out to be about 30 per cent. This very large advantage would be increased even farther by assuming a lower mechanical efficiency.

Benzene-Isooctane Base Fuel

The results obtained from the addition of nitromethane in varying concentrations to a 50-50 volume per cent mixture of benzene and isooctane are shown in Fig. 9. These data are for a 375 F jacket. Note that by comparison to Fig. 4, the mixture of benzene and isooctane as a base fuel yields less output than methanol, 127 vs. 142 psi. The mixture of benzene and isooctane was chosen because such composition more closely approximates gasoline composition than methanol, but has a higher solubility for nitromethane than gasoline possesses. The maximum output was increased from an indicated mean effective pressure of 126 psi to 135 psi by addition of 20 per cent volume of the additive. This was the maximum which could be tolerated before preignition began to have a large effect on power output. Similarly to the experience with alcohol when preignition was encountered, rapidly progressive loss of power quickly followed.

Since preignition was found to be the limiting factor in applying large concentrations of nitromethane, a cursory measurement was made of the knock tendencies of the various blends of nitromethane and isooctane-benzene. Octane numbers by motor method[13] are shown in Fig. 10, which illustrates the serious proknock tendencies of the additive.

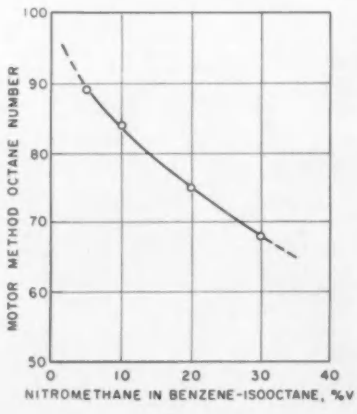

FIG. 10
Knock tendencies of nitromethane

Efficiency and Economy

As pointed out, the specific fuel consumption increased drastically with the addition of nitromethane. While specific fuel consumption is ordinarily considered sufficient for expressing relative thermal efficiency, because an inverse relationship is usually found to exist between efficiency and fuel consumption, this presumption is made on a constant heating value for the fuel used. When using nitromethane, with a heating value of only 5000 Btu/lb. as one component of the fuel mixtures, it is necessary to go beyond an analysis of specific fuel consumption in order to ascertain the effect of varying nitromethane content on thermal efficiency. Thus, Fig. 11, which shows indicated thermal efficiency as a function of fuel-air ratio, illustrates the fallacy which might result from presuming that indicated thermal efficiency and indicated specific fuel consumption might be inversely related in the case of nitromethane as a fuel additive. Fig. 11 shows that the indicated thermal efficiency actually increases from about 27 per cent with no nitromethane to 28 per cent with 20 per cent volume concentration, while from the previous Fig. 5 it was noted that the specific fuel consumption increased by 11 per cent or from 0.84 to 1.0 pounds of fuel per indicated horsepower hour.

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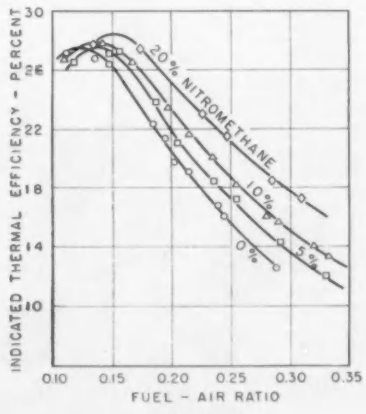
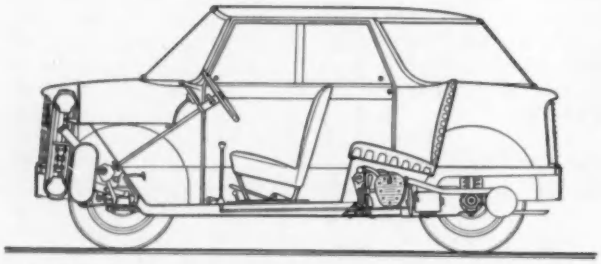


FIG. 11
Effect on thermal efficiency of nitromethane in methanol

New European Automobiles *Displayed at* Geneva Show



Soletta prototype which is powered by an aircooled engine located under the rear seat

By Robert Braunschweig

New Lancia Appia four-door sedan with 43.3-hp, V-4 engine

Front end treatment by Ghia-Lugano on Jaguar XK 140

GENEVA, SWITZERLAND

With 71 makes of passenger cars, including some three-wheel models, the 26th International Motor Show in Geneva was the largest and best-attended ever. Although the Swiss motor vehicle market is now dominated by a small number of makes, practically the entire automobile industry of the western world was represented. The new Ford Consul, Zephyr and Zodiac Mark II series from Dagenham, and the small Renault Dauphine, are expected to influence the Swiss import statistics which during the last few years have shown an increasing predominance of German-built automobiles. An unexpected sensation was provided by the Viberti Golden Dolphin prototype coach with plastic body, destined to be fitted with a Fiat-built gas turbine. However, this new vehicle is not planned for immediate production. See page 33 of April 1st issue of AUTOMOTIVE INDUSTRIES.

The American Motors' Metropolitan, which was shown in Geneva in a new version, is now available in Europe. This Austin-built car is fitted with the larger 90 cu in., 52 hp A50 engine and has a new radiator grille. The Italian Lancia Appia was presented in a new edition, retaining the tiny 66 cu in., four cylinder, 10-deg V-type engine, the

Alfa Romeo 1900 Super Sprint Gran Turismo with new body by Touring

PASSENGER VEHICLE IMPORTS INTO SWITZERLAND

Country of Origin	1955	1954	1953	1952	1951
USA	6,825	5,661	6,113	5,466	7,341
Germany (Federal Republic)	31,106	24,488	21,354	13,900	13,431
Great Britain	6,340	5,090	4,632	5,673	5,156
Italy	6,259	4,428	4,341	2,805	3,366
France	7,073	5,145	4,902	4,209	4,827

output of which is boosted from 38 to 43.3 hp at 4800 rpm, although the compression ratio was lowered from 7.4 to 7.2 to 1. The new body follows the notch-back silhouette and has a spacious luggage container.

Among other Italian developments was a new body on the Alfa Romeo 1900 Super Sprint sports chassis. This two-door coupe by Carrozzeria Touring of Milan has what many consider the cleanest lines of present bodies. A very low hood line has been obtained by lowering the engine and altering the carburetor layout. The Fiat 600, which was introduced at last year's Geneva show, now is available with a plastic-covered folding top and an improved interior finish.

New three-wheeled and miniature vehicles included the Soletta, the Belcar and the Heinkel. The Soletta is a prototype which incorporates a number of unusual features. Among them is the combination of a rigid rear axle and independent rear wheel suspension, where the differential carrier is suspended elastically in relation to both the vehicle structure and the wheels. Low amplitude oscillations are absorbed by the resiliency between body and axle drive housing, whereas greater road shocks will cause the swing axles to come into action. For the prototype, a 45 cu in. Condor motorcycle power unit is used. The Belcar, another Swiss built minicar, is a three-wheeled, three-passenger car of attractive design. The German firm, Heinkel, exhibited a three-wheeled, two-passenger vehicle with a forward-opening door following the Isetta pattern. These vehicles use unit power plants which are spring-mounted in the body structure and which can oscillate around their main suspension axis. Sports cars from various countries show different improvements. The Porsche Carrera 4 OHC engine has now been rendered much more versatile and is said to perform well within the entire range of 1500 to 7000 rpm. The two-litre Bristol engine can now be fitted to the British all-independently sprung A.C. Ace.

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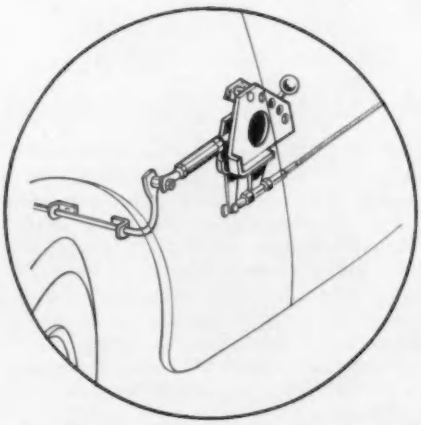


Level adjusting lever of Citroen DS 19 with connecting link and cable to suspension units

Looking Ahead 25 Years in Passenger Car Production

By Joseph Geschelin

TABLE I

FORECAST OF PASSENGER CAR REGISTRATIONS

In 1960, 1965, 1970, 1975

	Estimated Population July 1 (1) (000,000)	Estimated Passenger Car Registrations December 31 (2) (000,000)	Population per Registered Passenger Car (3)
1955	165.2	51.0	3.24
1960	179.4	56.4	3.18
1965	193.3	62.0	3.12
1970	209.4	68.4	3.06
1975	228.5	76.2	3.00

(1) Source: U. S. Department of Commerce, Bureau of the Census. This estimate is based on the 1954-55 level of fertility.

(2) Preliminary estimate by U. S. Department of Commerce, Bureau of Public Roads for 1955; publicly owned vehicles are included. 1960 and later years computed from population estimates and ratio of population per vehicle shown in last column.

(3) 1955 computed from first two columns. 1975 is an assumption based on continuing trends in increased real income per capita, increasing movement of population to the suburbs, and the resulting increase in the percentage of car-owning families and multiple car-owning families. 1960, 1965, and 1975 are interpolated from 1955 and 1975 data.

INTRODUCTION

IN these days of accelerated design developments, it is of vital importance to have some forecast of the course of passenger car production during the 25 years immediately ahead.

The necessity for this forecast—even though its accuracy may be questionable due to many variable factors—is apparent when one considers the tremendous impact of the automotive industries upon the economy of the country. Its impact is even more impelling when you equate it against a single segment of industrial activity such as the chemical industries.

This statistical study will show that under the conditions assumed by the author, annual motor car production may be of the order of 8,330,000 cars by 1975; and over 10-million vehicles (cars and trucks) per year. Estimated registration of motor cars alone by the end of 1975 is of the order of 76 million units.

From the standpoint of the chemical industries, the automotive industries represent the major consumer of iron and steel; heat resisting alloys; cast iron and malleable irons; aluminum and magnesium castings, forgings, and extrusions; strip and sheet steel; gasoline and knock-suppressing additives; natural and synthetic rubbers; plastics in molded and extruded form; lubricants and greases; electroplating chemicals and anodes; leather; upholstery materials; paper products; heat treated and laminated glass; copper and lead; paints and enamels; and a variety of other materials too numerous to catalog.

The Variables in the Forecast

Any forecast of future motor car production must take into account a variety of variables within the controlling factors of the equation. Consider the most important of these as listed in the following:

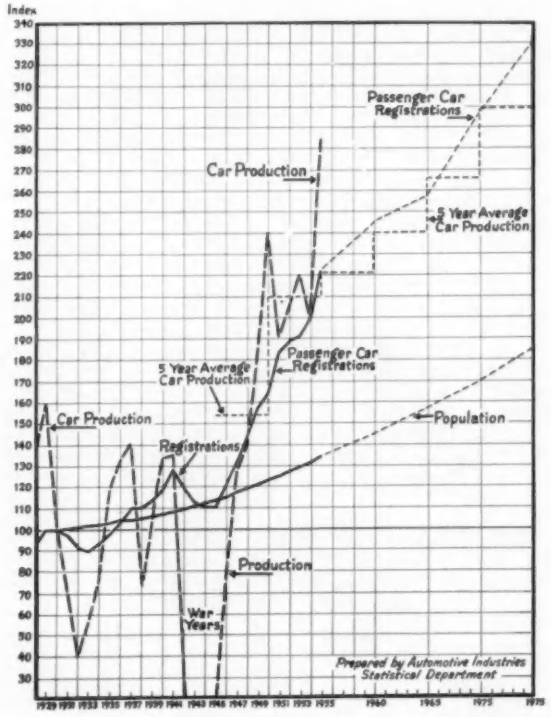
TABLE II

ESTIMATED ANNUAL PASSENGER CAR REPLACEMENT MARKET

By 5 Year Periods, 1955 to 1975

Period, Dec. 31 to Dec. 31	Average Passenger Car Registrations in Period (1) (000,000)	Annual Assuming 10 Year Car Life (000,000)	Replacement Assuming 11 Year Car Life (000,000)	Market Assuming 12 Year Car Life (000,000)
1955 to 1960	53.7	5.37	4.88	4.48
1960 to 1965	59.2	5.92	5.38	4.93
1965 to 1970	65.2	6.52	5.93	5.43
1970 to 1975	72.3	7.23	6.57	6.02

(1) Calculated from Table I.



Increases in Car Production, Registrations, and Population

1—Population growth in the country as a whole.

2—Effect of multiple car ownership on per capita use.

3—Life expectancy of vehicles and scrappage rates.

4—Rate of motor car exports.

These are the basic factors in making the forecast. Naturally they do not take into account the overwhelming influences of business cycles, wars, and catastrophies. The latter have been ignored in this study for lack of prophetic vision.

Table I shows in column one, the population estimates by five year increments (as of July 1) to 1975. Column three gives the assumed rates of per capita car ownership, the rate of three per car in 1975 being a free assumption that the trend will continue to multiple-car ownership. The figure for 1955 is actual; in 1954, it was 3.3, according to Automobile Facts and Figures, 1955 (source: Automobile Manufacturers Association).

Column two, Table I, obtained by dividing the value in column three into column one, provides an estimate of passenger car registrations during the period under observation.

The next significant factor in our equation is the estimated annual car replacement market. This must be based upon the life expectancy of motor vehicles as calculated by the AMA from statistics on scrappage rates. Although this is a critical factor, it is one of the most elusive and subject to strictly personal evaluation.

According to Automobile Facts and Figures (1955) the average age of vehicles has doubled since 1925. This is pictured in the tabulation given below.

Average Life of Motor Vehicles Doubled Since 1925

Year of scrapping	1925	1930	1935	1941	1953
Average life of vehicles scrapped in year indicated	6.5	7.0	8.3	10.2	13.8
Accumulated mileage during lifetime	25,750	41,500	58,000	85,500	122,000

Note: These estimates cover all motor vehicles and are based on scrappage estimates rather than on actual records of vehicles scrapped. They should be used as indicative of general trends only rather than precise measures of average life and lifetime mileage.

Source: Automobile Manufacturers Association.

(*Turn to page* 172, *please*)

TABLE III

ESTIMATED ANNUAL GROWTH IN PASSENGER CAR REGISTRATIONS

By 5 Year Periods, 1955 to 1975

Increase in Passenger Car Registrations, Dec. 31 to Dec. 31	Total for Five Year Period (1) (000,000)	Annual Increment (2) (000,000)
1955 to 1960	5.4	1.08
1960 to 1965	5.6	1.12
1965 to 1970	6.4	1.28
1970 to 1975	7.8	1.56

(1) Calculated from Table I.
(2) Previous column divided by 5.

TABLE IV

ESTIMATED ANNUAL PASSENGER CAR PRODUCTION

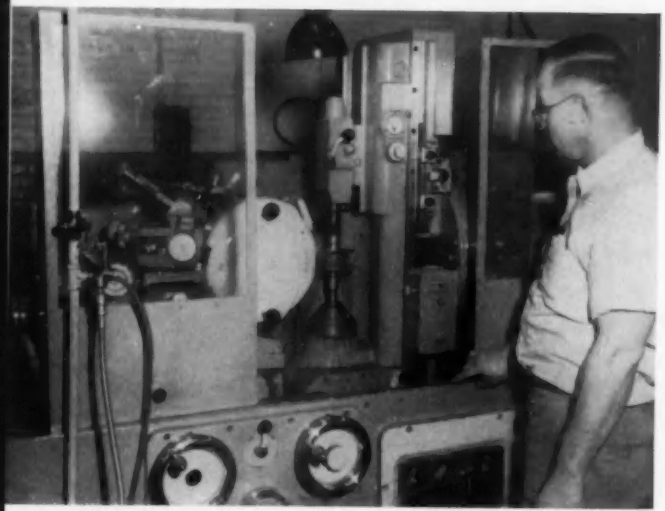
Average Production by 5 Year Periods, 1955 to 1975

		Passenger Car Production for:		
Assuming 11 Year Car Life	Annual Growth (1) (000,000)	Replacement Market (2) (000,000)	Export (3) (000,000)	Total (000,000)
1955 to 1960	1.08	4.88	.20	6.16
1960 to 1965	1.12	5.38	.20	6.70
1965 to 1970	1.28	5.93	.20	7.41
1970 to 1975	1.56	6.57	.20	8.33

(1) From Table III.
(2) From Column 3, Table II.
(3) Arbitrary assumption.

Close-up of work station of Bryant internal grinder set up for grinding the five pockets in the planet carrier, one at a time.

This is a view of the Red Ring helical internal gear grinder for finish grinding of teeth in the reverse torque ring.



Teeth of planetary gears used in the T-56 are finish-ground on this Reishauer gear grinder.

Special Manufacturing Techniques REQUIRED FOR Gas Turbine Engines

By
Joseph Geschelin

Gas turbine engine manufacture poses many problems that set it apart from mass produced piston type engines. The basic differences are readily discernible. Although unique product design with its differences in shape and size is an important factor, this is overshadowed by the difficulties imposed in the machining of special heat resistant alloys, by uncommonly close dimensional tolerances, and stringent quality control. Adding further to the equation is the need for special purpose machine tools despite the limitations of small volume.

This article is devoted to a sampling of some of the interesting methods employed by the Allison Div., General Motors Corp., in the manufacture of the T-56 turboprop engine. The mass of detail involved in this operation is so enormous that only a few of the operations can be covered. In the main, these are not common in motor car production. On the other hand, some of the basic concept may be of value to those concerned with unrelated manufacturing problems.

Incidentally, so much of jet engine activities is restricted because of military considerations that this is a welcome opportunity to study an advanced type of engine, released for commercial applications, hence free from restrictions.

One of the noteworthy techniques of recent origin at Allison is the coating of compressor case halves with a material that serves two purposes. On the exterior it provides an excellent form of thermal insulation to reduce loss of heat from the compressor section, thus improving thermal efficiency. On the interior, it provides a means of reducing the clearance between blade tips and housing to the minimum without the hazard of metal-to-metal contact. In the event of actual contact due to accident the blade tips can cut through the coating without damage.

Briefly, the coating consists of an aluminum base

General view in the assembly department showing the initial stages of T-56 engines in the foreground

liquid paint formulation known as Polytherm, intimately mixed with an accurately measured amount of desiccated asbestos fiber. After masking all areas of the case not to be coated, this mixture is sprayed on the case both inside and out, building up a layer about 3/32 in. thick. It is then air dried for 16 hours, masks removed, then baked for ten hours. During baking the temperature is progressively increased to a maximum of 500 F. Following this, the case halves are bolted together and the inner diameter bored to an established size, leaving a coating of about 0.025 in. in thickness on the inside between vane grooves. A sealer coat of aluminum paint is then applied to the inside, the painted and machined surface then being baked at 600 F. The cases are now ready for final inspection.

The row of new two-spindle Bullard Man-Au-Trol machines, illustrated here, handles the boring and vane grooving in progressive steps.

A noteworthy bit of improvisation is illustrated in the case of drilling, counterboring, and reaming of a large number of holes dispersed in bosses about the periphery of the compressor case. The simple equipment shown here, consisting of a manually-indexed fixture, is served by a number of overhead-mounted Keller Airfeed drills. These are selected in sequence by the operator for each station.

The planet carrier is an object lesson in the complexity and quality control involved in many of the component parts. Here is a forging of SAE 4340, weighing 54 lb in the rough. After machining and hand burring it is reduced to but 15¼ lb, roughly to about 28 per cent of the original weight.

It contains five pockets for planet gears, and a variety of dowel and mounting holes. Diameter of the pockets is held to a tolerance of 0.0005 in. Spacing of pocket centers and hole centers is held to a total tolerance of 0.001 in. of true position.

Serrations in T-56 turbine wheels are cut one at a time from the rough in a battery of heavy duty LaPointe vertical surface broaching machines.

Among the many individual operations performed on this part are a series of Cincinnati Hydro-Tel settings to finish-contour the periphery, to finish the scalloping both inside and outside as well as the other

forms of contouring required for this part.

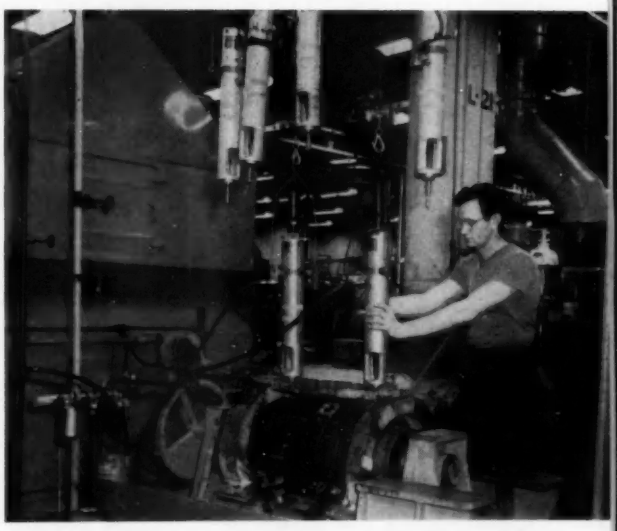
Eventually, the five pockets are finish-ground on the Bryant internal grinder seen here. Since the machine is of standard type, the important feature of the setup is the specially-designed eccentric, counterweighted fixture, so arranged that a pocket is located precisely on the grinding wheel center for each index.

Incidentally, the propeller shaft which is also of SAE 4340 steel, starts in the rough as a thick-walled, upset tube weighing 129 lb. Machining reduces this to but 59 lb, about 45 per cent of rough weight.

Allison boasts the installation of one of the few Reishauer (Swiss) gear grinding machines available in the U.S.A. As illustrated, it employs a formed grinding wheel suitable for finishing the variety of spur gears used in the planetary gear system of this engine.

Another novelty to many of our readers is the Red Ring helical gear grinder. The one seen here is used for grinding 107 helical internal gear teeth in the reverse torque ring. This large diameter ring is so light in cross section that it must be mounted in the heavy fixture seen at the spindle end. This ring is prepared for grinding by rough cutting the gear teeth in a Fellows gear shaper equipped with helical guides.

The T-56 uses 14 compressor wheel stages for the assembly. As a matter of interest we have selected the operation of machining the dovetail on the periphery. This is done on an impressive battery of vertical American surface broaching machines, one for each wheel. The number of dovetails ranges from 33 on the smallest wheel to 95 on the largest. The wheel is mounted on a heavy and rigid mounting plate on an inclined fixture, so arranged as to produce the proper angular location of the dovetail; and is indexed one dovetail at a time until the entire set has been completed.



Drilling, reaming, tapping, etc., of the numerous holes about the outside of the compressor case is done in stages in the trunnion fixture pictured here. The job is done with the aid of the variety of Keller air drills suspended overhead.

Compressor wheels are machined from forgings of AMS 5613 stainless steel alloy which is extremely difficult to cut. Using H-S-S broaching tools, ram speed is set between 11-13-fpm.

Another interesting operation is the dynamic balancing of compressor wheel assemblies, following the

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Electroless Nickel Plating

By J. L. Chinn, Production Design Engineer

Northrop Aircraft, Inc., Hawthorne, Calif.

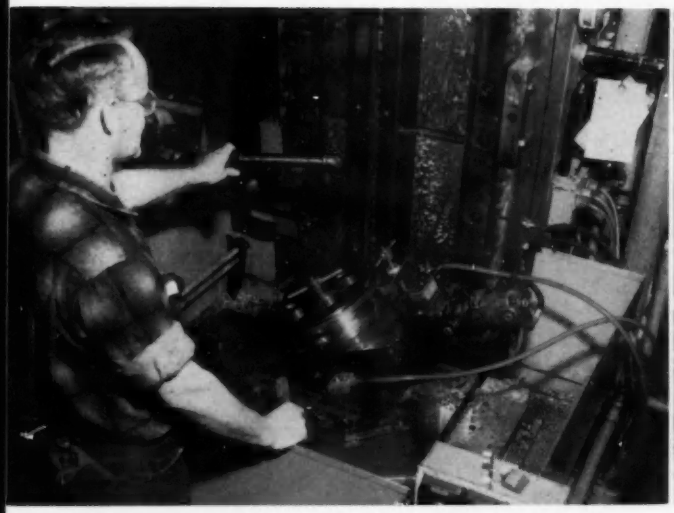
ELECTROLESS nickel plating is a relatively new and successful method of depositing high quality nickel coatings without the use of electricity, and offers a solution to many metal-finishing problems heretofore unsolved. This system enables the deposition of precisely uniform thickness of nickel on the interior and exterior surfaces of such metallic materials as steel and certain alloys of copper, aluminum, and titanium. Electroless plating, in contrast to conventional electroplating, possesses infinite throwing power, and can consequently be used to plate the deepest recesses and the most complex of parts. The deposit material is composed of 93 to 97 per cent nickel with the remainder being phosphorus; however, for most design purposes, it may be considered pure nickel.

The Process

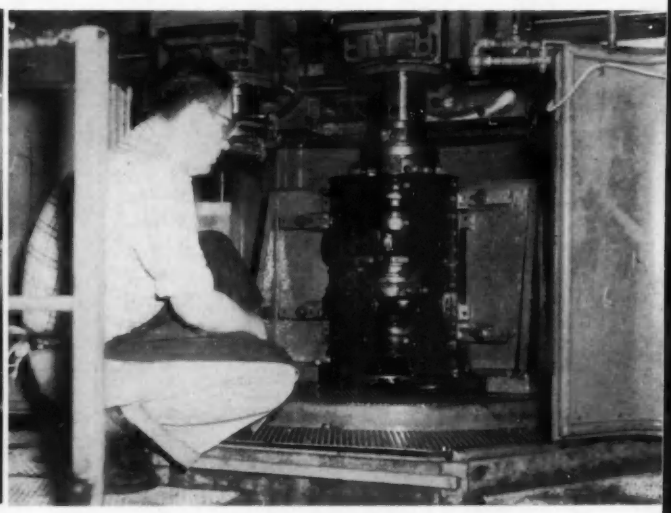
Electroless nickel plating is a process of metal deposition that is effected by adding a chemical reducing agent, sodium hypophosphite, to a buffered solution of a nickel salt. Parts to be plated are simply immersed in the hot solution. Gentle agitation of the plating solution may or may not be employed, depending upon the individual plating requirements. The deposit thickness is controlled by the length of immersion time and also by the temperature of the plating solution.

Standard tests have shown that the adhesion of electroless nickel is superior to conventional electrodeposited nickel; values exceeding 50,000 psi have been recorded. The superior adhesion of electroless nickel is a result of the combined adhesion of a chemical and mechanical bond. Although conventional electrodeposition provides an electro-chemical bond, it does not, due to inferior throwing power, provide the equivalent mechanical bond or "dove-tailing" effect.

The "as-plated" appearance of electroless nickel plate is either matte or bright, depending on the surface condition of the part before plating and on whether or not a brightening agent is added to the plating solution. For instance, the surface of a part with a 4 microinch finish will be bright after



Dovetail slots in compressor wheels are cut around the periphery in American vertical type surface broaching machines. This is a close-up of one of the broaching machines, showing the method of holding the work as well as the detail of the broaching tool. In this operation the part is indexed one tooth at a time.



The sequence of boring operations, grooving, etc., required on the compressor case is handled in a battery of two-spindle, Bullard Man-Au-Trol machines. One of the boring operations is seen here.

setting of blades. This is done in a special GMR balancing machine to a final balance tolerance of 0.1 oz-in. Here balancing is accomplished by interchanging blades from the light to the heavy side at the area on the periphery indicated by the balancing machine. Apparently the operators become sufficiently skilled to handle this exacting selective operation quite rapidly.

Finally, we come to the rather difficult problem of producing the dovetail serrations on the periphery of turbine wheels. These "hot" section wheels are machined from forgings of Type 410 stainless steel alloy, another tough-to-cut material. Four stages of turbine wheels are employed in the T-56, ranging from 65 to 102 serrations for the set.

These serrations are cut directly from the rough in a setup in a group of massive, LaPointe vertical surface broaching machines, having a stroke of 96-in. Considering the nature of the material and the amount of metal removed, it is surprising to find that the job can be done with a ram cutting speed of 16 to 17 fpm.

• • •

plating while an as-cast surface will be relatively dull.

Standard ASTM salt spray tests which were performed in the Northrop Aircraft Materials & Process Engineering Laboratory have proved that the corrosion-preventing qualities of electroless nickel plate, as recommended deposited by the Chemplate Corp. of Los Angeles, are equivalent or superior to electrodeposited nickel plates. For example, a steel specimen, coated with an 0.0021 in. thick electroless nickel deposit, withstood 288 hours in the salt spray cabinet without any sign of rust.

Minimum electroless plate hardness is Rockwell C43 "as plated" while a minimum hardness of Rockwell C55 is obtainable by a post-plating thermal treatment. Some plateable materials, such as 24S aluminum alloy, may be adversely affected if exposed to plate hardening temperatures.

The only limitation of electroless nickel to plate the deep recesses and channeled holes of complex parts is the ability of the plating solution to come in contact with the surfaces to be plated. For example, the inner walls of 0.030 in. diameter by 0.250 in. deep nozzles have been successfully plated with electroless nickel.

Wear resistance is directly dependent upon anticipated service. Therefore, no general statements can be made with detailed accuracy. However, because of their five to seven per cent phosphorus content, electroless nickel deposits possess an inherent lubricity, and in specific instances have been found to be superior to other finishes with respect to providing wear and abrasion resistance. Table I gives comparative data on the wear resistance of electroless and electrolytic nickel deposits, tested on a research model Taber Abraser using CS-17 calibrase wheels and an operating pressure load of 1000 grams. The base of all test specimens was 0.040 in. thick type 4130 steel.

TABLE I
Comparative Wear Resistance of Nickel Plates

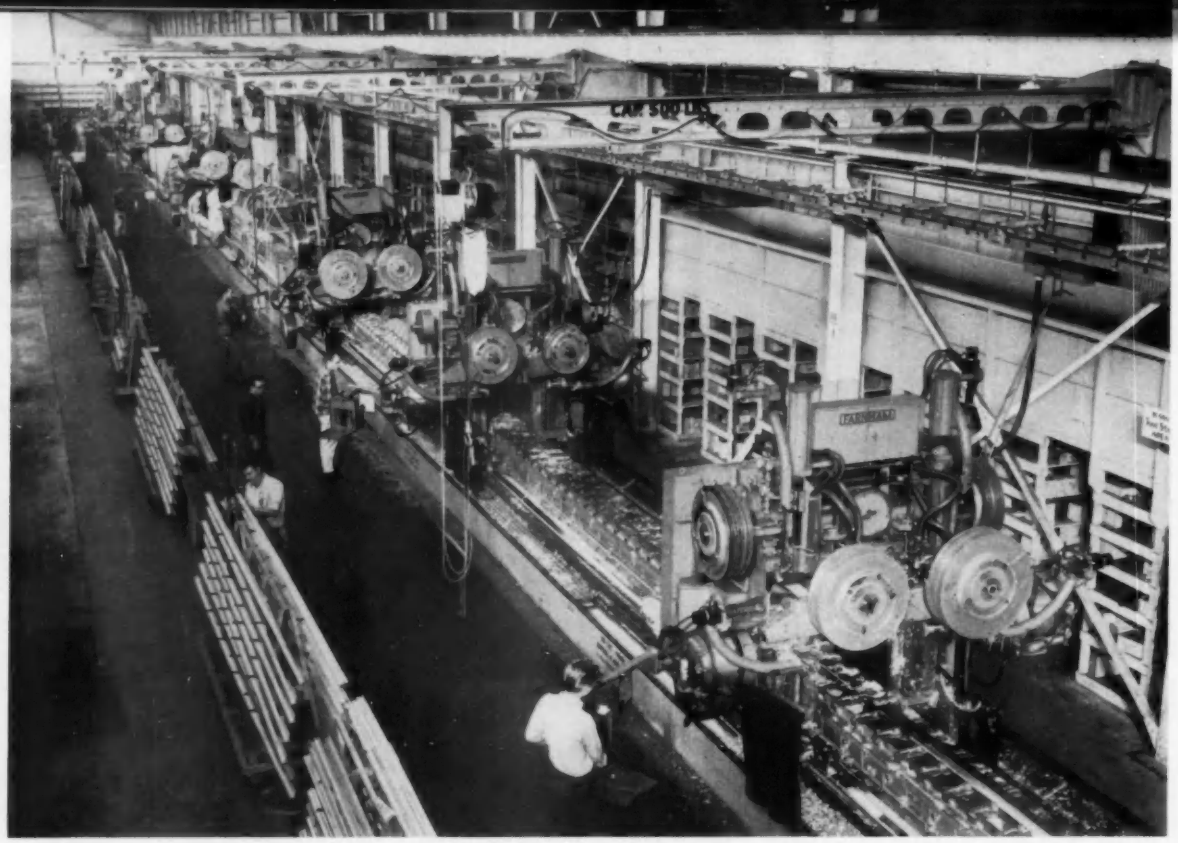
Specimen Number	Type of Deposit	Avg. No. of Cycles Per 0.0001 in. Plate Thickness to Cause Wear-Through
1	Electrolytic Nickel	1,328
2	Electroless Nickel	2,757

Advantages

Several distinct advantages of electroless nickel deposits are: Electroless nickel deposits do not build-up at sharp corners or fail to plate recesses. A coat of even thickness is deposited on all surfaces in contact with the plating solution.

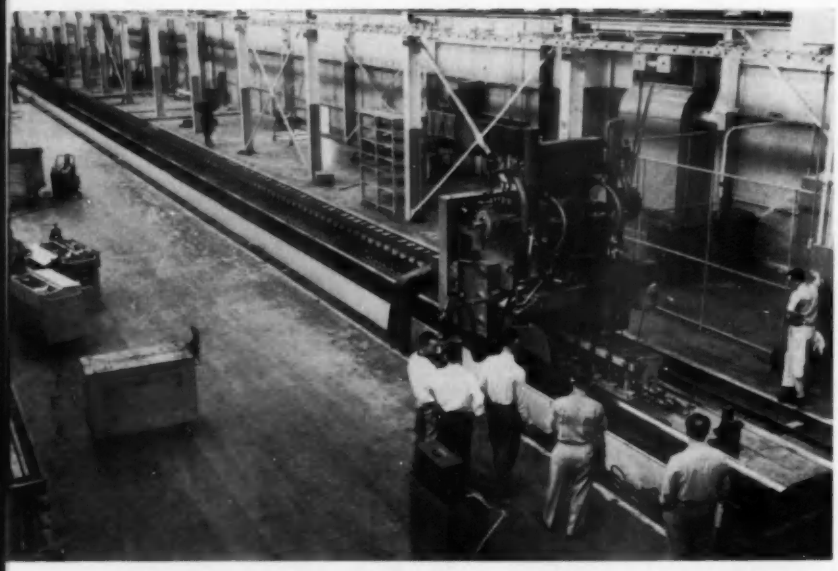
The close thickness tolerances which

(*Turn to page* 154, *please*)



View of part of the huge Long Mill showing spar cap mills and overhead cranes

World's Largest Machine for Milling

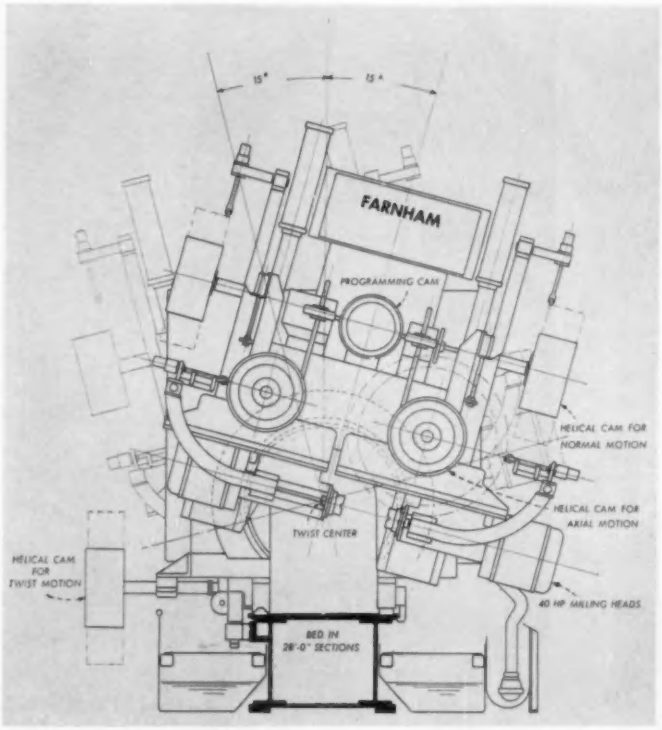


After assembly on the machine bed the work-holding surface was machined to insure parallelism with the ways of the machine

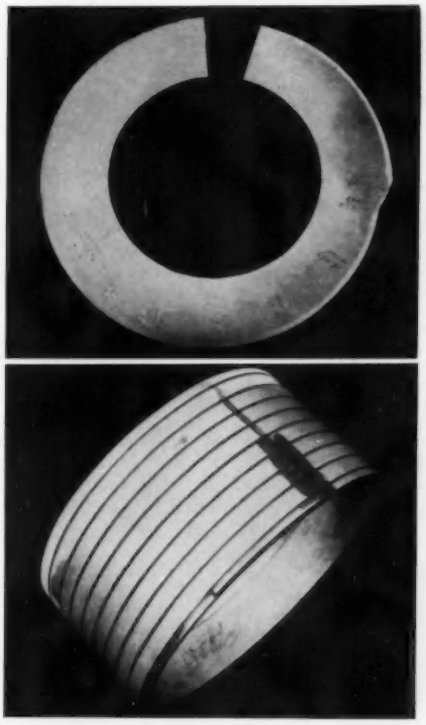
A 308-ft Farnham machine, called a Long Mill by its makers, has brought a new concept to spar milling in producing parts for the Navy's planes. The product of a team composed of Farnham and Douglas El Segundo plant and tool engineers, the Long Mill includes eight integrated carriages with automatic cycling devices that control its 16 cutting heads.

The Farnham Long Mill is the largest machine of its type in the world. It is a projection from the past into the future, best illustrated by the old-fashioned belts on a line shaft that powered wood working machinery.

That line shaft formed the power unit for a number of wood-working machines. They could all be run at the same time, or, by a shift of the belt, could be selective and run only the machines required. So it is with



Integrated twist carriage for long mill



Top: Spar cap profile template segment. Bottom: Spar cap profile template mounting drum

Aircraft Spars

By C. F. Wallace, Project Tooling Engineer

Torrance Facility, El Segundo Div. of Douglas Aircraft Co., Inc.

the Farnham Long Mill developed for Douglas.

Designed for flexibility in handling the trend toward integrally stiffened parts, the Long Mill fashions integrally stiffened spars, an entirely new concept in spar category. In effect, the Torrance location of the Douglas El Segundo, Calif., Division, where parts are made for the Navy's F4D Skyray, has the equivalent of eight spar mills, each as long but not longer than required.

Each carriage on the machine's bed operates individually. Each does its own job in the space required for the job. A number of identical, or dissimilar, parts can be strung end to end on the bed and machined in rapid succession. An overhead crane running the length of the machine can pick up any carriage from any position and leap-frog it into any other position on the bed. When the carriage is plugged into the parallel power supply it is ready for operation.

There are two types of carriages—straight and twist carriages. Both types have two 40 hp, 3600 rpm milling heads designed to stand 100 per cent overload for 30 minute periods. Mist lubricated and air-cooled, the bearings are mounted to stand the thrust of high helix cutters in both directions.

The twist carriages are identical in operation to the straight carriages, but, in addition, the whole head assembly can be twisted 15 deg each side of the vertical.

Each cutter head on either type of carriage is independently tracer controlled, both vertically and horizontally. This tracer mechanism is hydraulic with direct rigid feedback.

The templates are a newly developed helical packaged type composed of developed $\frac{1}{8}$ in. thick aluminum fins permanently mounted on aluminum Tenzaloy drums. The packaged templates, identified by the part number of the piece it will produce, ride on the carriage above the cutter heads. The template drum is geared to the carriage movement and rotates with the hydraulic tracer in constant contact.

When not in use, the template package is removed without disassembly in two or three minutes and stored in identified wooden boxes with the corresponding tool in an adjacent area.

The packaged template eliminates errors of set-up and guess-work so common when templates are the assembled type carried on the bed of conventional spar mills. As the template controls movement for any

complete work piece, it eliminates loss of mating template parts that could necessitate new tooling.

By pressing one control button the complete operational cycle is started, beginning with the starting of the coolant pump and ending with the stopping of the spindle and the shut-off of air for spindle lubrication and chip removal when the work is complete.

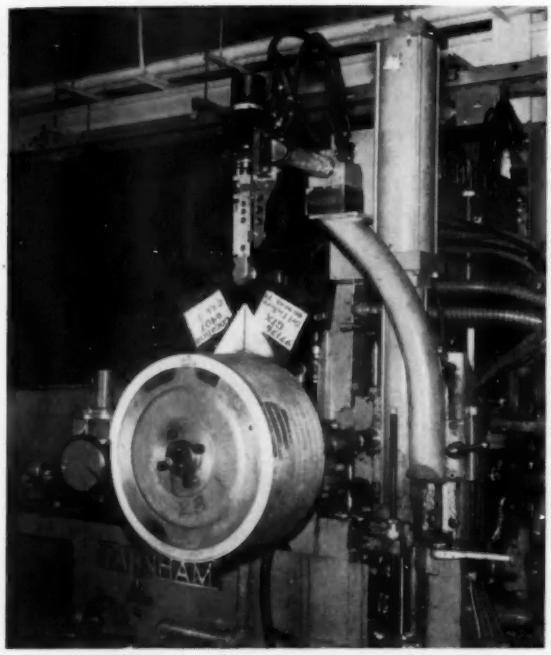
Emergency stop buttons on either side of the carriages bring all operations to a halt immediately. Manual control can be substituted for automatic if desired.

A chip trough is on each side of the 308-ft bed and they develop into flumes when the chip laden coolant cascades to the chip-collecting filterer. The chips are reduced in size for ease of bricketing in a machine for that purpose. The filtered coolant is channeled into a special trough that parallels the entire bed. Submerged in this clean coolant trough on each carriage is the intake that feeds each head from the carriage's 150-gallon coolant pump.

Farnham furnished everything on the Long Mill below the hardened steel ways of the basic bed. Douglas El Segundo tooling engineers designed the entire tooling requirements from the bed up.

The sub-base of universal type is capable of receiving any kind of work fixture deemed necessary and to hold it, and the part, secure during milling. This base is divided into four-foot units that carry their own hydraulic valves for clamping action. Inter-connected by links as desired, any number of multiple units in increments of four feet can be actuated with one lever. Additionally, each work clamp is valve controlled so that the carriage itself can trip the valve, permitting use of flying clamps.

The work holder, of Meehanite, was completely designed and fabricated in the Torrance Plant. It is 288 ft long, composed of 72 four-foot sections. Its

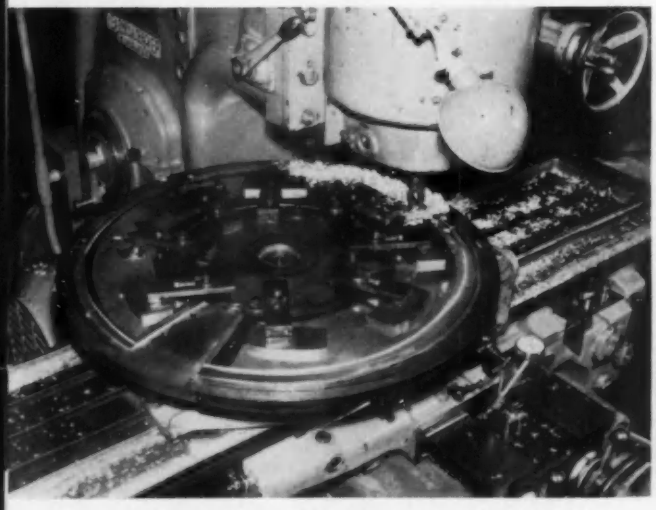


Master set-up cam for spar cap

more than two miles of hydraulic lines are fed from two 50 gpm pumps, and contain 1200 hydraulic cylinders, 600 cam valves, and 216 hand valves, together with over half a million other detail parts.

After assembly on the machine bed, the entire 18 in. wide surface was machined on assembly to insure parallelism with the ways of the machine.

The mill fixtures, as well as the production part, is held securely by the hydraulic clamps which are integral with the work holder. These clamps are quickly



Cam contour milling for spar cap tool fabrication

Inspection of individual segment cam

adjustable for fixtures from 6 in. to 15 in. wide.

Any one of the eight carriages may be quickly coordinated to the part being machined by moving the carriage so that the centerline of the spindle is directly over the centerline of the cross keyway in the work holder and turning the cam drive by hand until the cams are in zero position. This is accomplished by means of a master cam.

After the machine is on zero, the cams and mill fixtures are installed by means of small overhead boom cranes. The spiral cams are made in segments as illustrated. They are individually machined to precalculated dimensions on a rotary table with a low lead attachment. The design drawing gives the toolmaker the lead as well as the proper change gears to obtain the desired lead on the cam. Individual segments are inspected to the tooling drawing, and again inspected after assembly on the drum to insure utmost accuracy.

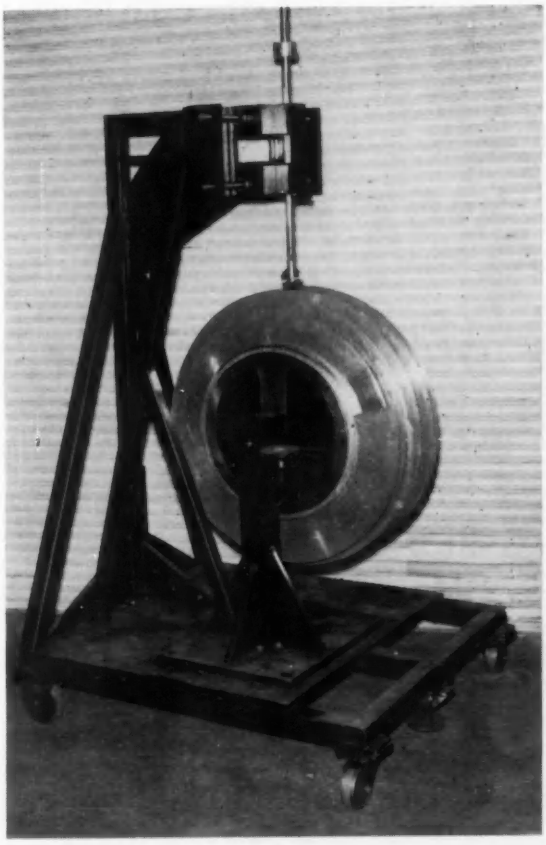
The cutters used are two-tooth carbide inserts with 25 deg helical angle and 15 deg positive rake angle for maximum cutter life and finish. With a proper grind and balance, both statically and dynamically, a 63 micro finish may be obtained.

At least 80 per cent of the parts machined are tooled for milling, both forward and reverse. This is accomplished by making a right and left hand integral cutter on the same spindle. On the reverse cut, the spindle is reversed and the horizontal cam moves the cutter over so the opposite hand part of the cutter only comes in contact with the work piece.

To accomplish this, the cams are assembled in such a manner that on the extreme travel of the carriage, the grooved cam follower runs past a switch very much like a railroad switch, and on the reverse cut, the cam follower rolls over on a different cam which is assembled between the segments of the forward cam.

This permits operations to be performed complete with one carriage which normally would require passing two carriages over the work.

The innovations in this new concept of spar milling are the result of fine cooperation and coordination between Douglas El Segundo Divisional Tool Design, Tool Fabrication and Plant Engineering Departments working as a team. To attempt to duplicate the work possibilities of the Long Mill with individual spar mills would not only have been more expensive in initial cost but also in tooling as well. In addition, integral spars are multiple milled on one set-up providing more efficient operation, greatly reducing handling and work space is kept to a minimum, while assuring a more even flow of work through detailing and processing.



Final inspection of cam

• • •

Bonding Adhesive Discussed In Recent Air Force Report

The Air Force has published a report on the development of a structural metal-to-metal bonding adhesive that requires a low curing temperature. Designated P-262A, the adhesive consists basically of methacrylic acid and methyl methacrylate and was found to meet most of the research objectives. It possesses properties comparable to those required by Military Specification MIL-A-8331 (USAF).

The report contains a step-by-step presentation of the development, formulation and processing as well as an analysis of the properties of P-262A. Also covered in the report are details on the preparation of aluminum surfaces to make ready for the bonding operation.

The report also describes the testing procedures which led to the development of the adhesive. It is said to be suitable for the fabrication and field repair of certain airframe structural parts where the use of heating and pressurizing equipment would be impracticable or impossible.

Government Car Expenses Run High in Comparison

Government civilian agency expenses for running a passenger car average more per year than those of the private car owner. Official records show a typical Government car traveled 11,603 miles at $.0386 per mile in fiscal 1955, for a total of $447.87.

An average car owner, reports the American Petroleum Institute, pays $325 per car per year. Of every dollar the motorist spends, 43.2 cents is for gasoline.

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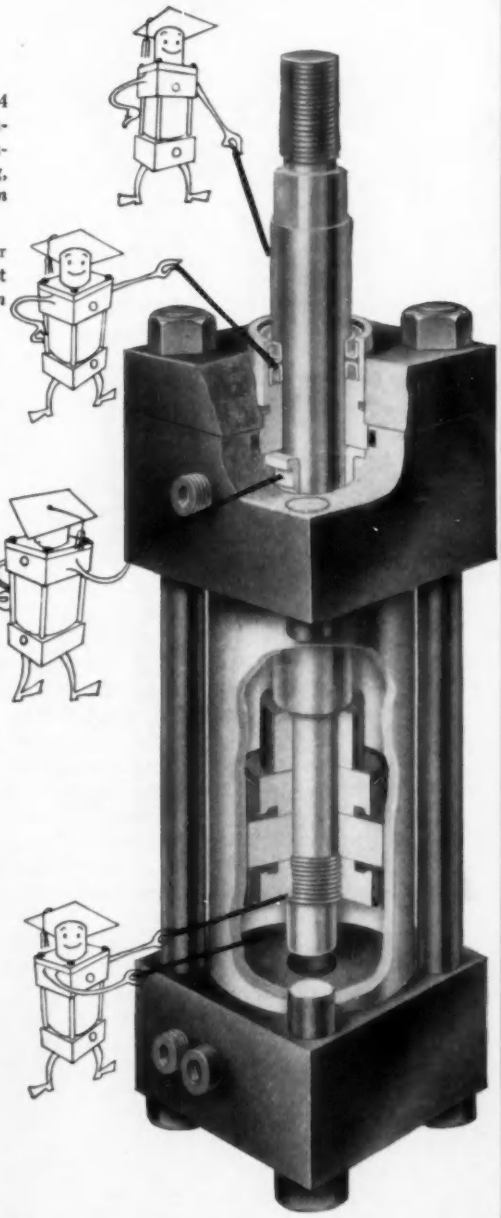

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Shell Molding Among Chief Subjects at

SAE Annual Production Forum

• By Thomas Mac New •

SHELL molding, forging of high temperature alloys, and free-machining steels stole the spotlight from automation at the SAE's Annual Production Forum in Cleveland last month. There was much discussion on the accuracy of shell-molded parts, forging with molybdenum, and machining with leaded steels.

During the three-day meeting, eight panel discussions were held in addition to two plant tours—Alcoa's heavy press plant and Republic's 98 in. strip mill.

• SHELL MOLDING •

It was brought out by T. B. Wilkinson, sales engineer, Monsanto Chemical Co., that over 10,000,000 lb of resin for shell molds was used in 1955 and that it is anticipated that six times that much will be used five years hence. This is just an example of the acceptance of the process for mass production parts. Two engineers, one from GM and the other from Ford, gave some very interesting data on the activities of their respective companies. Portions of their presentations are presented herewith:

Advantages of Shell Molding

By H. G. Sieggreen

Chief Engineer, Central Foundry Div., GMC

Central Foundry Division has come to regard the shell molding process as one of the most important advances in foundry technology of our era. From comparatively small beginnings in 1951, we have steadily increased our facilities for the process to a rather substantial level. Last year, we produced and shipped over 20,000 tons of shell molded castings, covering approximately 50 parts in plain grey iron, alloy grey iron, malleable iron and ArmaSteel. This year we expect to ship more than 63,000 tons, which more than triples the 1955 level.

The "governor body" and "bushing" for the Hydra-Matic transmission represent the first production jobs at the foundry. Since these parts started production in 1951, we have produced almost 5,000,000 sets to date.

These parts were formerly made of aluminum die castings, but the steel piston rings used in conjunction with the aluminum governor body caused excessive wear in the grooves. In the past, it had not been possible to cast these parts in a ferrous material because of the intricate coring involved. However, with the use of a shell core and the shell molding process, this has now become a relatively simple job to cast in grey iron, and wear in the ring grooves has been practically eliminated.

The nominal machining stock allowance on these two parts is 1/32 in. and in some areas it is even less. Of special note is that a hole is cored completely through the large casting.

The position of the grooves cast by the core must be in perfect alignment with that made by the cope shell. The minor diameter of the core is 5/16 in. and this diameter is machined to 3/8 in. by the casting user which obviously doesn't allow much of a margin for casting or machining errors.

A universal joint rear yoke used on the 1956 Pontiac propeller shaft is now shell molded of ArmaSteel. ArmaSteel is GM's trade name for pearlitic malleable iron. It is poured from the same base iron as regular malleable, however, special heat treatment produces a structure consisting of temper carbon nodules in a matrix of pearlite. The properties of this material combine the simplicity and adaptability of castings with the strength usually associated with forgings. An important advantage of the casting is the elimination of machining on the OD and ID of the large tubular body. The close dimensional control and small draft angles on the shell castings made these operations unnecessary. Because this area does not require machining, it was possible to incorporate ribs which greatly increase the fatigue life of the part.

Other advantages of the shell castings are:

(1) Virtual elimination of pattern shift problems.

(2) A hole is provided through the splined tube without the use of a core.

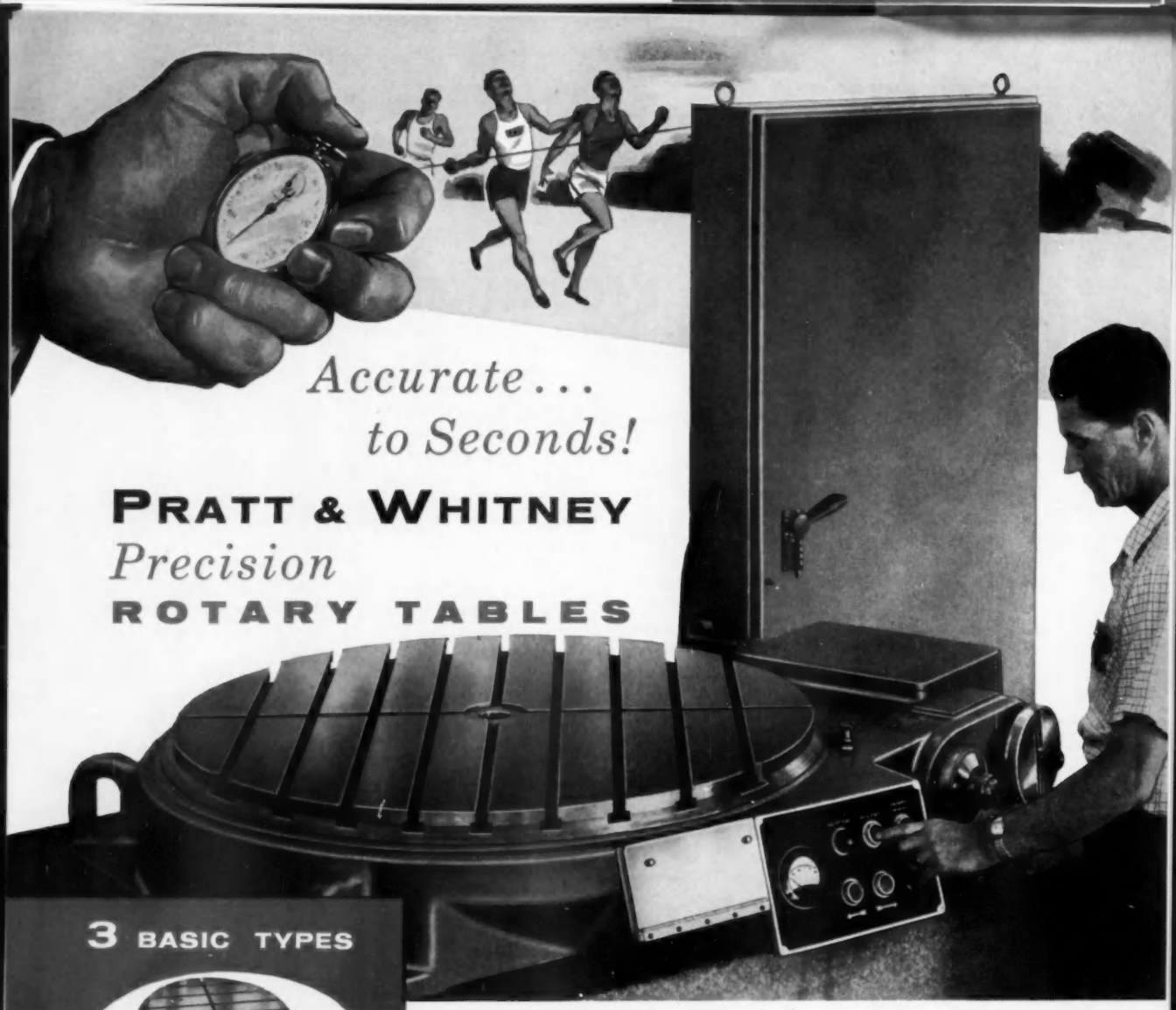
(3) Sharper detail and well filled out corners and edges.

(4) Increased tool life, resulting in less down time for tool changes.

Another important shell mold application in the division is in the production of V-8 camshafts. At the present time, we are producing these camshafts for three builders of V-8 engines. Probably the most outstanding advantage of this molding process for camshafts is lower scrap in both the machine shop and the foundry.

Other advantages are:

(1) Better dimensional control for automatic handling. (*Turn to page* 136, *please*)



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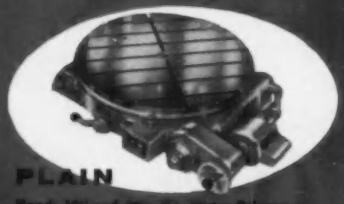
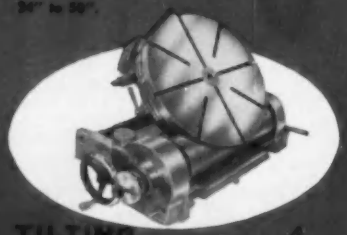


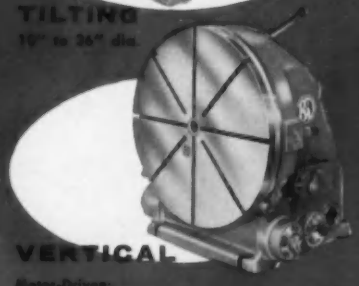
PLAIN

Round, 12" and 20" dia. Motor-Driven; 24" to 50".



TILTING

10" to 24" dia.



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Motor-Driven; 30" and 48" dia.

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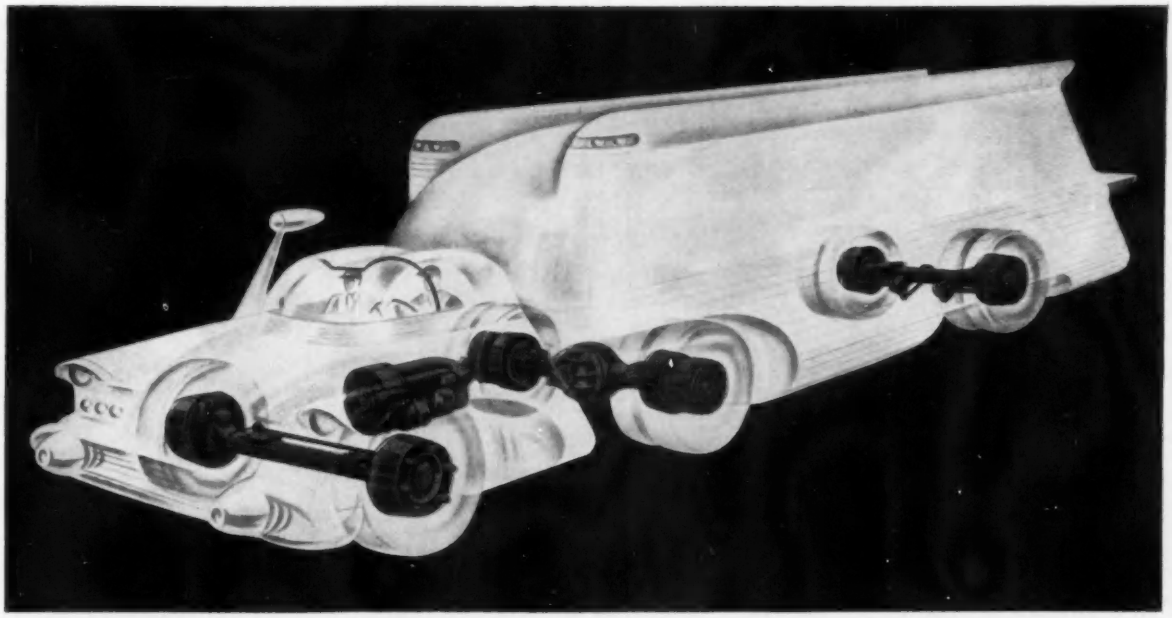

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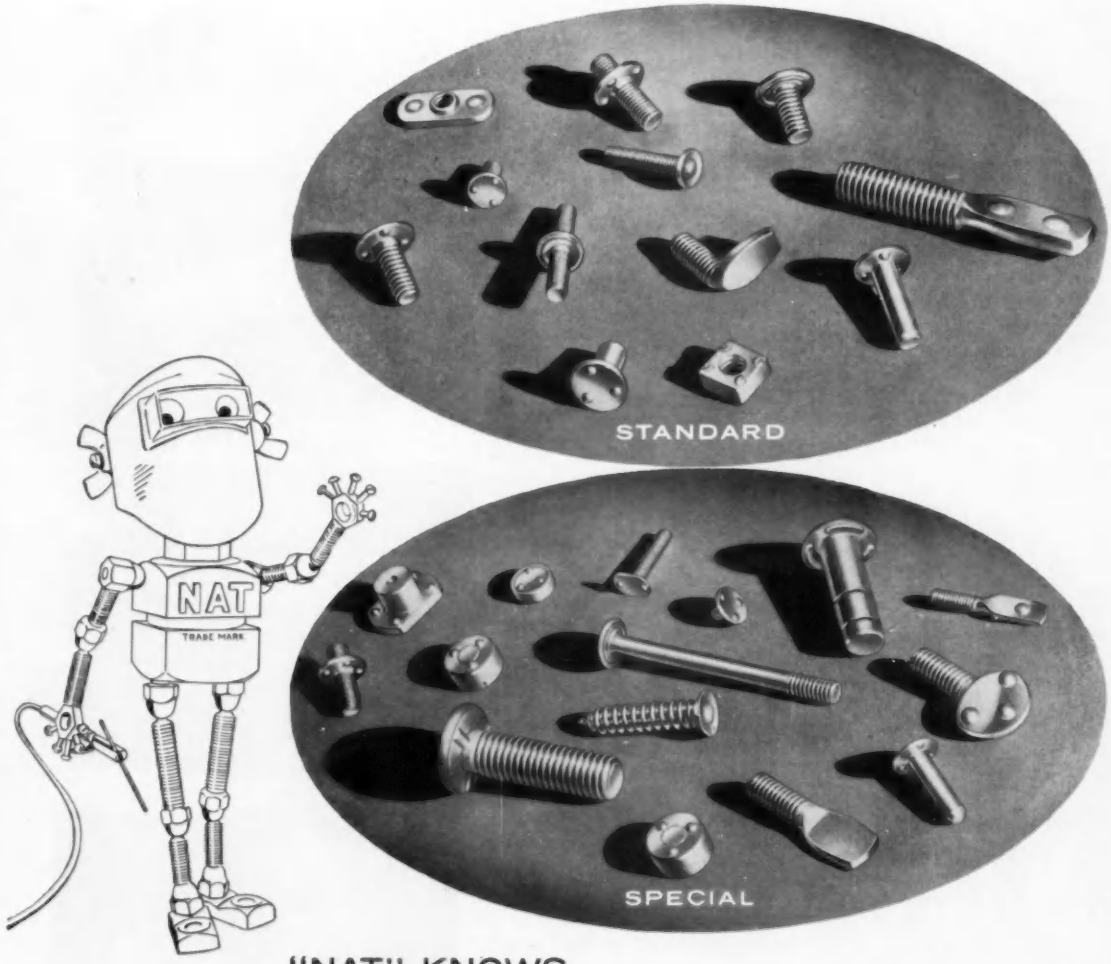

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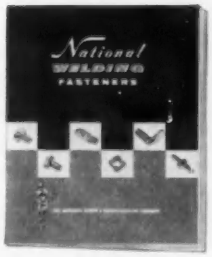

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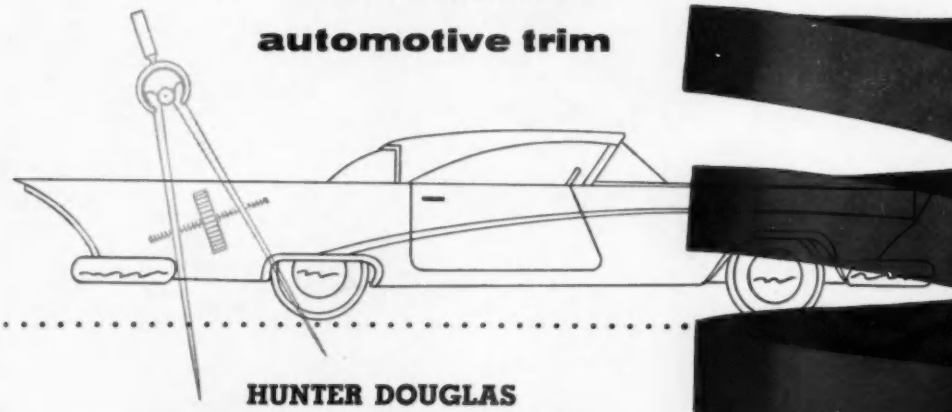

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

The Function of Machine Tools Is To Raise Standard of Living and Form a Basic Arm of National Defense, According to Louis Polk, President of NMTBA

Polk Tells NMTBA Two Selling Jobs Needed

Machine tool builders must learn to sell the function of machine tools in the national economy as well as selling machines, Louis Polk, president of the Sheffield Corp., and President of the National Machine Tool Builders' Association, told members of the Association at its two-day meeting in Houston late last month.

"From the standpoint of the general public," Polk said, "the function of machine tools is, first to raise the standard of living without severe unemployment and similar dislocations. Hand in hand with this belongs our second function as a basic arm of national defense, which is also imperative.

"To fulfill these essential functions we must maintain continuous programs of research and development. Unless we obsolete our own models by new and better machines, fulfillment of our economic function becomes impossible.

"And we must reach broader segments of executives both in industry and in Government. It is right to sell a foreman on a new electronic control —but we must not overlook selling the president of a company upon the wisdom of keeping equipment modern and effective. The shop superintendent is rightly interested in the elimination of a secondary operation—but it is equally important to sell the controller of a company on a program of reducing costs.

"In addition to talking about that important number of pieces per hour on a certain operation, let's talk to top management about the imperative need for greater mechanization or automation in a competitive economy faced by a widespread labor shortage in the years ahead."

Machine Tool Makers Cited in U.S. Order

The Government has ordered three machine tool companies to end restrictive cross licensing agreements and to make all existing patents and those obtained in the next five years available to any applicant at reasonable royalties. Named in the federal injunction are the Michigan Tool Co., National Broach and Machine Co., both of Detroit, and Fellows Gear Shaper Co., Springfield, Vt. The three firms, the Government contends, have been doing more than 60 per cent of the gear machine-tool business in the U. S.

Five Machine Tool Firms Ordered to Split Combine

Five machine tool companies, which allegedly restricted their patent rights among themselves, have been ordered by the Government to dissolve the combine. According to a U. S. Supreme Court ruling, the firms denied other companies access to their patents by pooling them into a holding company they formed more than 20 years ago called Associated Patents, Inc., Cincinnati. Initial action against the companies was instituted nearly five years ago in an anti-trust suit by the Federal Government.

The final judgment in the case came last year, and the high court has now upheld that ruling after an appeal by the defendants.

Defendants named included DeVlieg Engineering Co. and DeVlieg Machine Co., both of Ferndale, Mich.; Brown & Sharpe Manufacturing Co., Providence, R. I.; Carlton Machine Tool Co., Cincinnati; and Lodge & Shipley Machine Tool Co., Cincinnati.

On the Installment Plan

The National Automatic Tool Co., Inc., has announced a new installment plan that will allow 10-year terms with payments geared to new depreciation schedules. The new financing program was worked out with C.I.T. Corp., and it marks the first time NATCO has offered its machines on installment terms. The company will offer three-year terms on an equal-monthly-payments basis. Terms to 10 years will be offered on a Pay-As-You-Depreciate plan under which monthly payments during any year of the contract will total approximately what can be depreciated schedules.

The Lodge & Shipley Co. now offers a new financing plan to prospective customers. The plan, developed by the First National Bank of Cincinnati, is extremely simple. It breaks down into three steps: 1. The distributor submits his financial statement to the bank and executes a uniform agreement with the bank. 2. For the customer to qualify, he gives usual credit information which will be evaluated by the bank and by Lodge & Shipley. 3. The distributor obtains proper lien documents and assigns them to the bank. From that point, the bank takes over. The purchaser makes payments directly to the bank using a monthly coupon payment book which the bank furnishes.

Sales Force Expanded by Michigan Drill

Michigan Drill Head Co. has completed a major sales expansion program which gives the company blanket representation in the U. S. and Canada. Jerome E. Sullivan, president of the company, told the press that since the firm's new plant was opened 18 months ago, the demand for its products has been greater than ever before. According to Mr. Sullivan, Michigan Drill representatives will trouble-shoot the production problems that now exist in every major metalworking area of the U. S and Canada. These sales representatives will, in turn, keep the engineering staff fully informed of the specific problems encountered. In this way, Mr. Sullivan reported, the company can use its engineering skill and know-how to help lick the problems, and, insure faster, more economical production.

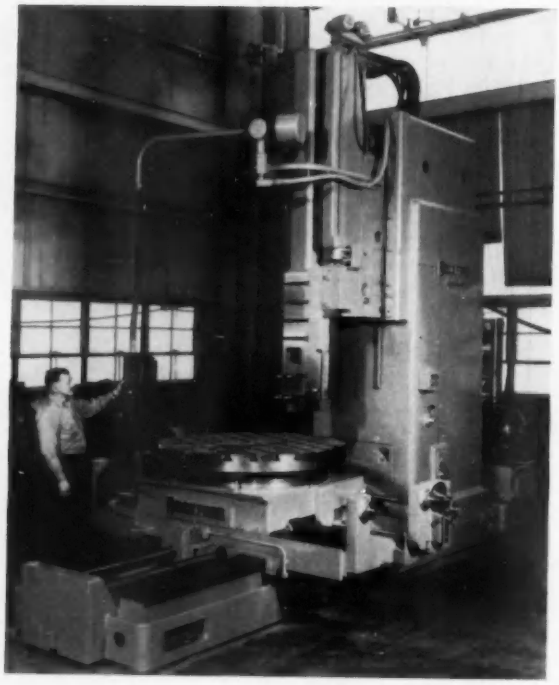
Ex-Cell-O Earnings Up

While its sales last year totalled about the same as in 1954, net earnings of Ex-Cell-O Corp. rose slightly to $9.4 million from $8.8 million in the previous year. The company's fiscal year report for the period ended Nov. 30 shows sales increased slightly to $92.4 million from $92.2 million.

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Heavy Duty Hydraulic Slotter



Rockford Model SM heavy-duty hydraulic slotter is made in 36 and 48-in. sizes, and is equipped with full hydraulic drive with two speed ranges. Movements are operated and controlled from the push-button pendant station of the machine.

MODEL SM is the designation for a new hydraulic slotter which is available in 36 and 48-in. stroke length sizes. One of its most important features is that all cross, longitudinal and rotary movements are full pendant-actuated and controlled.

The machine is equipped with full hydraulic drive, having two speed ranges, with servo control to the pump so that cutting speed may be infinitely varied from zero to maximum in either range. Feeds are hydraulic and they also may be infinitely varied from zero to maximum. Feeds and speeds are both controlled from the pendant.

Longitudinal, transverse and rotary movements are operated and selected from the push button station of the machine. No levers are required for engagement of any feed or traverse movement. Two-speed traverse is available, enabling the operator to position the work to a few thousandths, without manual movements, although manual control of all movements is available from either side of the machine.

The machine is equipped with a built-in dividing head arranged for power operation. A pre-determining counter automatically stops the table, for any selected number of turns, within one-tenth of a revolution. This eliminates manual labor for approximate rotary positioning, requiring the operator to manually index only for very precise rotary location. The position of upper and lower reverse dogs on the ram may be changed from the push button station. This enables the operator to lengthen or to shorten the stroke, without using levers or cranks. The ram may also be locked from a button on the pendant, thus providing control of all movements directly from the pendant.

The pendant is a counterbalanced design, swinging to 240 deg, thus permitting the operator to run the machine from any convenient position. The ram may be tilted up to 10 deg. The tool holder is arranged with auxiliary clamping surfaces for maximum efficiency in holding the slotting bar.

Hydraulic tool lifter is available as an optional accessory, as well as hardened and ground saddle-ways and bed-ways. A 40-hp variable delivery, radial piston pump of latest design is used for hydraulic power. All electrical equipment is standard, single direction with conventional control. Automatic pressure lubrication is provided to the ram-ways, the bed-ways and the saddle-ways. *Rockford Machine Tool Co.*

Circle 20 on postcard for more data

Billet Descaler

FOR handling hot forgings, a billet descaler which employs a 2200 PSI, triple nozzle water spray, has been revealed. Known as the Andresen unit descaler, it is self-contained and portable. Only shop air is required for power; no electric power or water connections are needed.

The descaler is usually located adjacent to the hot forging press. When billets are inserted in the unit, the water spray is automatically released. Production capacity is rated at 240-360 per hour, for billets up to six-in. diam. Provisions are made for hand, conveyor or pusher loading. *Richards Co.*

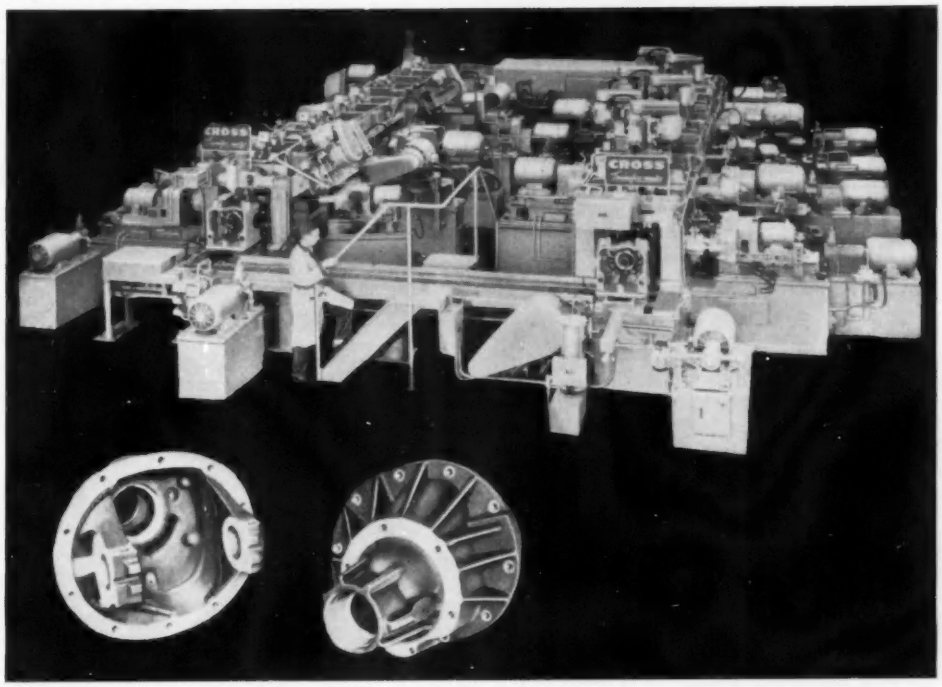
Circle 21 on postcard for more data

Vibrator

DESIGNED for use on hoppers, feeders, molds, gage panels and packaging machines, a new small-size mechanical vibrator, called the Vibrolator SAH-10, is for operation on air or steam. Frequency of vibration is infinitely variable from zero to more than 50,000 cpm. Operating pressure may vary from 5 to 150 psi. It is self-starting, self-cleaning and sparkproof. *Martin Engineering Co.*

Circle 22 on postcard for more data

Multi-Station Transfer Machine for Differential Gear Carriers



This machine, designed to process differential gear carriers, is capable of producing 115 pieces per hour at 100 per cent efficiency. It rough and semi-finish bores the pinion bores and cross bores; rough and finish faces and turns the pilot diameter of the torque tube flange; mills the faces of the cross bore bosses; spot - faces the flange mounting holes; and drills, chamfers, reams and taps all other holes except the flange holes. In all, 73 operations are performed: 8 milling, 8 boring, 2 cross-facing, 1 turning, 18 drilling, 10 spotfacing, 7 chamfering, 2 reaming, 9 tapping and 8 probing. (Cross Co.)

Circle 23 on postcard for more data

Deburrs and Chamfers

INTRODUCTION of a new single station deburring and chamfering machine that chamfers both sides of a gear simultaneously is announced. The Model BME-14 Duplex removes sharp edges on the ends of gear teeth and simultaneously gets rid of the burrs resulting from the gear cutting process. Spur gears, helicals and straight sided as well as involute form splines from ⅝ to 6½-in. pitch diameter can be handled at a production rate up to five teeth per second per side. At the end of the automatic chamfering cycle, the electric clutch stops rotation of the workpiece with the cutters in the "out" position for easy loading and unloading.

Parts to be chamfered are placed on the work spindle, taking central location from either the hole or shaft diameter and vertical location from the edge of the gear or spline. Radial location and indexing of workpiece is taken from the gear teeth proper. To chamfer the gear or spline, two dovetail form cutters are stroked simultaneously past the edges of the teeth, one at the bottom the other at the top. Depth of chamfer is infinitely variable with the adjustment being made in the tool holders.

Fixtures are so designed that they can be replaced with other tooling when production must be shifted to a new gear or spline. The machine is equipped with upper and lower cam-actuated rocker tool assemblies, precision ball bearing intermittent indexing assembly with provision for radial adjustment of pilot gear for radial tooth location, and ball bearing mounted vee belt drive totally enclosed with necessary safety guards.

Modern deburring and chamfering machine

It is built to JIC electrical standards. Motor is 1 hp, 1200 rpm, 220/-440-v ac. Floor area required is 32 x 42 in. *Modern Industrial Engineering Co.*

Circle 24 on postcard for more data

Blast Cleaner

DUST-FREE blast cleaning is said to be possible with a new self-contained abrasive cleaning tool called the Educt-O-Matic. Being portable and weighing but 11 lb, it can be used for a variety of applications, such as cleaning inside of tanks and welds, and removing paint. The swivel blast head permits blasting in all directions, and includes blowing and suction sections. This design is said to provide the equivalent of a housing around the area being blasted. Within this area a suction is created which removes dust and recovers the abrasive used, carrying them into the body of the machine, where the abrasive returns to the feed hopper and the dust bag retains the dust.

A single ½-in. air line is the only connection required. The machine operates on 33 to 60 cfm air supply at 90 to 100 psi. *Clementina Ltd.*

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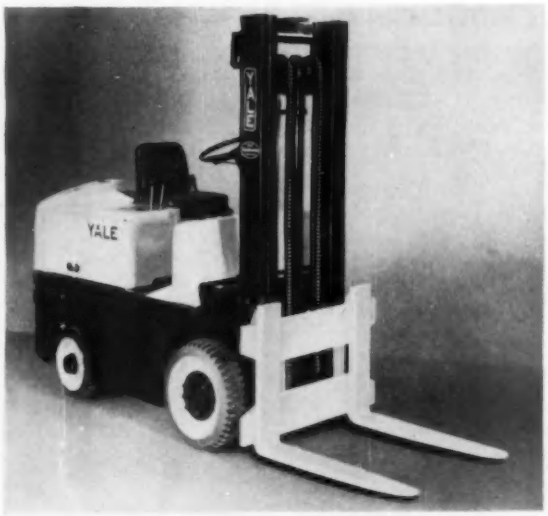

Yale & Towne Model KGA-51 fork truck, with torque converter transmission which permits "inching" of truck and simultaneous fast lifting of loads and operation of attachments.

Fork Truck Line Introduces New Features

AMONG the features of a new line of fork trucks are torque converter transmission, self-adjusting brakes, power steering, and high travel and lifting speeds. Lower silhouette lines, a clear floorboard, waterproof instruments grouped in the lowered cowl, and recessed driver's seat are also featured. The upright construction is roller mounted and of the "open vision" type. Operator visibility is improved by the hydraulic hose being concealed within the channels, and by locating the driver's seat to the left of the truck's cylinder. The recessed driver's seat keeps the operator's head below the uprights for safety. The lowered cowl permits a clear view of the fork tips and facilitates load handling.

Controls for hoisting, lowering and tilting, as well as for the operation of attachments for handling different types of loads, are located for right-hand operation beside the operator. Forward or reverse travel, with the torque converter transmission, is obtained by the flick of a switch located on the steering column.

In addition to the self-adjusting, wheel-mounted hydraulic brakes, the electric trucks have a deadman control built into the seat which automatically sets mechanical wheel brakes when the operator leaves the truck. This feature is also available on the gas models.

Additionally included in the new line are the use of an anti-cavitation unloading valve and a flow regulator valve. The unloading valve is mounted in the hydraulic tilt system to prevent the possible formation of a void which would cause channel sway and loss of positive control. The flow regulator is for assuring smooth lowering control without excessive speed regardless of size of load.

Underwriters' Laboratories GS approval has been awarded gas trucks in the line incorporating prescribed safety features in the design. This approval permits operation in areas where fire hazards are high.

All gas trucks can be obtained with the new fully-automatic hydraulic torque converter transmission; with fluid coupling; or with standard transmission. Available in gasoline, LP-gas, Diesel and electric models, capacities of the trucks range up to 10,000 lb. *Yale & Towne Manufacturing Co.*

Circle 26 on postcard for more data

Tap Drivers

A NEW line of tap drivers, designated "Safe-Torque," accommodating a wide range of tap sizes and providing torque adjustment to suit varied operating conditions, are said to offer a number of advantages. Tap breakage is prevented or reduced because a modified over-riding clutch disengages the tap from the driver. Slow-down for blind holes is not needed, and there is no noise or impact on release. Pre-set torque remains constant, giving good control; and the free-wheeling release action assists in producing uniform threads. The drivers have torque settings for each tap size. *Scully-Jones & Co.*

Circle 27 on postcard for more data

Parts Escapement

A STANDARDIZED parts escapement is available to manufacturers and design engineers who are planning installation or conversion to automatic parts feeding. It is designed to be attached at any point along the feed track. Spring loaded fingers automatically release the individual parts. The escapement will not jam or damage piece parts, according to the announcement. No special slots or track junctions are required. The device will automatically release up to 200 parts per minute, one at a time. The escapement fingers can be shaped or formed to accommodate any piece part up to three in. in diameter. Escapements are available for solenoid or air cylinder operation. If a convenient vertical movement is available, mechanical linkage may be used. *Dixon Automatic Tool, Inc.*

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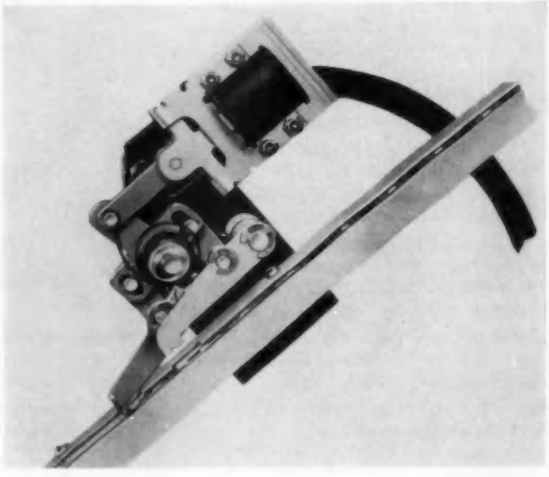

Dixon escapement is designed to save development time

Automated Underpass Gear Shaving Machine

A GEAR-O-MATION equipped underpass gear shaving machine is finishing gears automatically in a large automotive plant at the rate of 260 per hour. The unit consists of an underpass gear shaver with vibrating hopper feed, automatic loading, a three-way probe-type gear classifier and control panel.

In addition to controlling the operation of the machine, the control panel counts correct size gears and keeps track of oversize or undersize gears on both a percentage of production and total count basis. A feedback system actuated by the gear classifier through the control panel automatically corrects center distance when gears come undersize or oversize. If this condition persists, machine shuts down automatically for the required corrections.

Stock over pins removed in the shaving operation is 0.004 to 0.006 in. The 18-tooth pinion with a 15½ normal pitch, has a left hand helix angle of 22 deg, 11 min, 30 sec, face width of 1⅛ in., and OD of 1.1419 in. Bore diameter is 0.6876 to 0.6881 in.

Outside diameter on the stub arbors is held within 0.6873 to 0.6875 in., which gives a light press fit between gear bore and stub arbors when the gear is being shaved. Pneumatic cylinder which operates the headstock center is 6 in. diam, while the tailstock cylinder is four in. When the gear is loaded, the headstock center, powered by the larger cylinder, bottoms against a stop when its stub arbor enters the bore of the gear. The smaller tailstock cylinder does not bottom, but exerts full pressure on the headstock stub arbor. Both stub arbors are instantaneously withdrawn after the gear is shaved. This setup is said to make possible consistent accuracy of the shaved gears.

After the gears are shaved, they pass through a chute to the three-way gear selector, with correct size gears passing straight through. Any undersize or oversize gears are diverted, with the control panel counting each one. This quality control setup with the feedback system checks every shaved gear. *Michigan Tool Co.*

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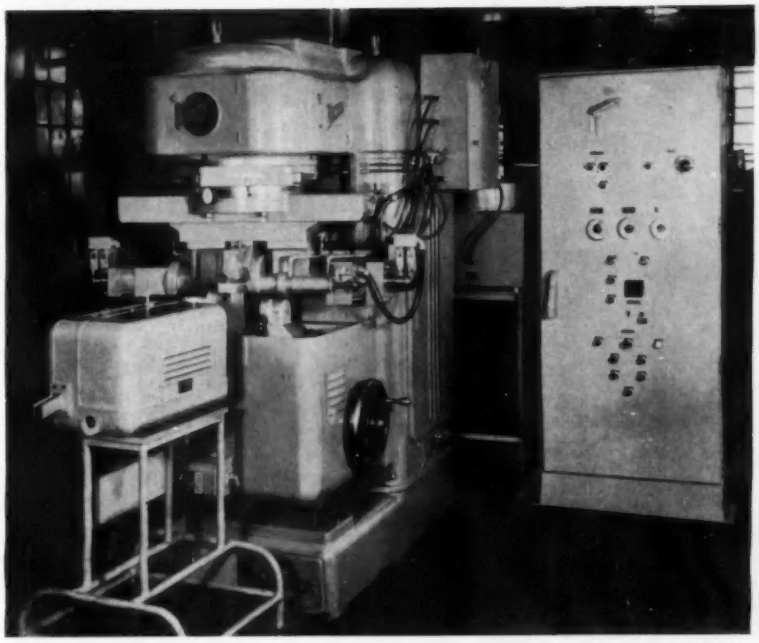

Michigan underpass gear shaver, Gear-O-Mation equipped, finishes automotive pinions at 260 per hour. Stub arbors on both headstock and tailstock are air operated.

Rotary Actuator for Remote Control of Valves

DEVELOPMENT of a new hydraulic or pneumatic control device having an internal helix arrangement which converts the in-line motion of a hydraulic or pneumatic cylinder into a rotary movement, has been announced. This unit is applicable to the remote control of valves, and can be operated with air, gas or hydraulic pressure. Actuators are provided with "fail-safe" provisions if desired.

The rotary actuator can be designed to produce any reasonable degree of rotary movement desired from 0 to 360 deg, or more if necessary, by increasing the overall length of the helix piston rod assembly. It can be made to stop at any rotation point through the use of switching. By using a slip clutch in the unit, many varied rotary sequences can be obtained. It is thus possible to obtain unlimited rotation by a series of partial rotation cycles. A wide range of lb-in. torque requirements are met with five standard models, ranging from a three-in. bore with 350 lb-in. at 100 psi, to an eight-in. bore with 3360 lb-in. of torque at 100 psi.

The unit was primarily developed as an actuator for lubricated plug valves. However, because of the variety of rotary movements possible, the manufacturer is presently testing the use of the unit in such applications as index positioning, control of tumbling cycles, controlled agitation, swing motions, progressive turning cycles on machinery and others. *Carter Controls, Inc.*

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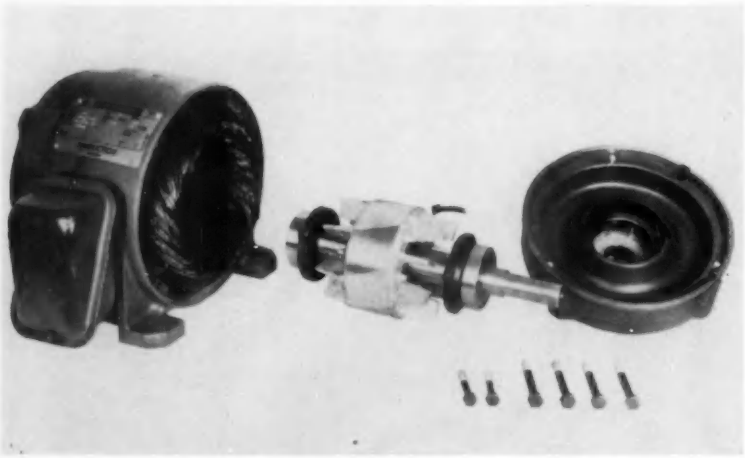
Carter rotary actuator



View of typical Allis-Chalmers SYNDUCTION motor disassembled. This new synchronous motor uses a simple die cast rotor and has operating efficiency and power factor approaching that of a standard squirrel-cage motor.

Synchronous Induction Motor Has High Efficiency

FOR general industrial use, a basically new synchronous motor has been announced. Called the SYNDUCTION, the motor is available in ratings from ¼ to 40 hp, is built on standard induction motor frames and enclosures, and uses a simple die-cast rotor. It was developed by combining the constant speed characteristics of the synchronous machine with the mechanical construction of the induction motor. It may also be considered as a variation of the synchronous-reluctance motor. The stator is like that of a typical squirrel-cage induction motor. The motor requires no brushes, slip rings or windings on the rotor, separate source of direct current excitation, or special starting equipment as is the case with standard synchronous motors. Full load power factor of the SYNDUCTION motor is normally higher than that of a reluctance motor and close to the values of a similarly-sized squirrel-cage machine.

It starts as an induction motor with a high locked-rotor torque, accelerates and pulls into synchronism quickly, and runs as a synchronous motor. Having a high (175 to 200 per cent) pull-out torque, the motor remains in synchronism regardless of load or line voltage fluctuations.

The new motor has been designed to operate over a wide frequency and, consequently, a wide speed range. Frequencies of 300 cycles and speeds above 10,000 rpm are available. Motors for frequencies as low as 10 cycles have been developed. The motors need only standard across-the-line starting equipment, except in the very largest ratings, where reduced voltage starters are required.

The first units were built for a processing unit where a large number of motors must remain synchronized over a wide speed range. It is expected their availability may open new possibilities in the machine tool industry and others where automated equipment must be synchronized. For applications where operation of several motors must be synchronized over a range of speed, an electro-mechanical device has been developed to supply variable frequency for these motors. *Allis-Chalmers Mfg. Co.*

Circle 31 on postcard for more data

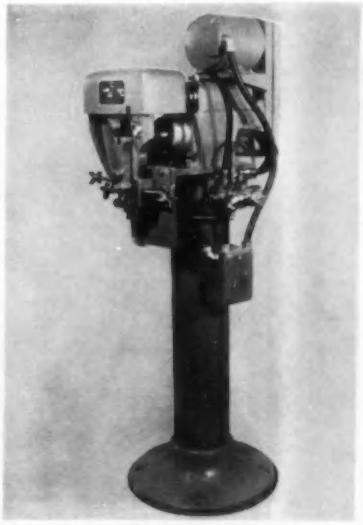
Close-Spacing Driller

INTRODUCTION of the Speedy Driller, a versatile, high-speed, semi-automatic drilling machine, has been announced. An experimental model has been used in an aircraft plant for some time for drilling the attaching holes in sheet metal parts which have flanges, such as wing ribs, fuselage frames, and longerons.

Originally developed to make the thousands of rivet pilot-holes required in the flanges of formed aircraft detail parts, it automatically locates and drills holes in response to saw-toothed projections on an attached template. These holes may be drilled at speeds of up to three per sec in 0.064 aluminum material, holding locations to sheet metal tolerances of ±0.010-in. Speed of operation is dependent upon hole spacing, diameter, depth, and the type of material being processed.

Tooling required for the operation of the pedestal-mounted machine consists primarily of a sheet of template stock, cut to extend ¼-in. beyond the face of the material to be drilled. This overlapping edge is notched so that the front edge of each tooth is directly over the center line of the hole to be drilled. Locators and clamps are employed to position the part on the template. Both template and part are fed across the machine, with the flange of the part fitting into an adjustable slot on the front of the driller. The toe of the flange rides on an adjustable stop which is pre-set to the required distance from flange toe to center line of hole. During the drilling operation, full support of the flange is obtained by adjusting a vertical guide to suit the length of the flange.

When the part and template are fed into the machine, the template's teeth engage a trigger mechanism, forcing it against a dead-stop. This mechanism actuates the machine, automatically drilling a hole directly in front of the face of the template tooth. When the drill reaches the fully-retracted position, the trigger assembly automatically releases the template, allowing template and part to be moved forward to the next tooth for repetition of the cycle. *Fairchild Aircraft Div., Fairchild Engine and Airplane Corp.*



Fairchild Speedy Driller

Circle 32 on postcard for more data

Sciaky resistance welder equipped with the new dekatron control for exactly timing and duplicating welding operations

Welder Functions Are Precisely Timed

A NEW timing control for electric resistance welders which counts cycles of line frequency, will meet the exacting requirements of welding materials such as high heat-resistant, heat treatable metals, according to a recent announcement.

Heart of the system is the dekatron tube, a cold cathode type gas tube having a common anode and 10 cathodes with two guide pins between each pair of cathodes. When power is applied to the tube a negative voltage is applied to the cathode which is to be fired. When the counting operation is started, pulses are fed to the guide pins and the glow is transferred from one cathode to the next until the count has been completed. This count may be any amount from 1 to 10, and any operation which will furnish a pulse may be used to trigger the tube. By adding a decade dekatron the count can be increased to 100. Adding a third dekatron will increase the count to 1000, the maximum used. Only one dekatron tube is needed to control the functions of squeeze, preheat, weld, quench, post heat, hold and off times. Another dekatron tube is used for the heat, cool, and current delay functions.

All of the welder functions are synchronous. The control dials for timing operations are calibrated in cycles, while the control dials for interval functions are calibrated in impulses of secondary current. The actual functions produced by the welder are said to be the same as the control settings, regardless of the number of secondary current impulses, over the entire range of adjustment. Exact duplication of weld settings for satisfactorily reproducing welds is reported to be readily accomplished without periodic check-out.

The rectifier used with the dekatron control, of a new principle, is said to be more precise, with a wider range of heat control. The phase shift control provides an approximately linear adjustment of the secondary current with a stepless vernier having 10 equal divisions of heat adjustment.

An added feature of the new control system is the use of plug-in sub-assembly units designed to minimize down-time and facilitate the adding of extra welder functions. *Sciaky Bros., Inc.*

Circle 33 on postcard for more data

Conveyor Safety Control

AN automatic safety controller, which provides warning and prevents damage from abnormal load conditions on electrically driven conveyor systems, is announced. The electro-mechanical device, called the Tipp-Tronic, is said to eliminate the need for shear pins, slip clutches and other mechanical safety devices, where equipment may be damaged by accidental jam-ups. The unit also gives protection against extreme overload and the need for lubrication; and not only features conveyor protection, but also electric motor protection. The device shuts off the conveyor system at any predetermined load setting, acting upon variations from normal load over a wide range. It may also be set up to give warning of trouble before the shut-off stage is reached.

On multi-motor-driven conveyor applications, one Tipp-Tronic may be used as a control on the total current of all the motors, or one unit may be used with each motor. It is not affected by line voltage variations. On most conveyor applications, the unit is reset manually after it has given an alarm and shut off the system. *Tipp Manufacturing Co.*

Circle 34 on postcard for more data

Pyrometer Housing

A STANDARD explosion-proof housing for the company's Models J, JP and JS pyrometers is designed to meet UL specifications for Class 1, Group D hazardous locations. Its cast iron body is bolstered at test-shown stress points and holds a 1¼-in. thick block of clear safety glass. The large area of this glass, four by six-in., assists view of the scale and pilot lights. An external temperature setting knob is provided so that the bolted cover does not have to be removed to change the temperature control point. Housings can be furnished for existing equipment. *West Instrument Co.*

Circle 35 on postcard for more data

Paint Booth Coating

CALLED Oakite Shield, a sprayable paint booth coating that strips off in large pieces, has recently been introduced. Applied by either spray or brush to dry booth surfaces, the new material is said to dry fast and to cling tightly to vertical surfaces under paint over-spray. When painting has been completed, the film peels off readily with a minimum of shredding.

The new product is said to have the consistency of paint, to be odorless, non-toxic, and non-hazardous to store and use. *Oakite Products, Inc.*

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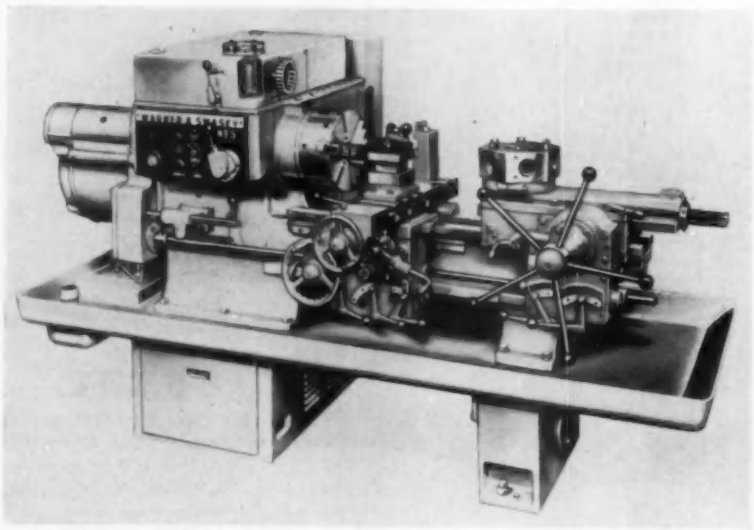

Warner & Swasey's No. 5 universal ram type turret lathe.

Universal Ram Type Turret Lathes

SIMPLIFIED operating controls and faster speed changing through the use of a new all-hydraulic headstock are among the design features of two universal ram type turret lathes recently introduced. Designated No. 4 and No. 5, both machines are adaptable to existing tooling and in addition can be used with the very latest in special turret lathe attachments.

Operator's controls are zoned, with one lever at the headstock actuating all speed changes; another lever providing forward, reverse, brake or free spindle operation. A headstock mounted direct-reading speed preselector, calibrated in rpm's, surface speeds, and work diameters, makes possible rapid selection and use of the proper spindle speeds for every cut.

The all-hydraulic headstock, which eliminates gear shifting by means of constant mesh helical gearing and direct-acting hydraulic clutches, provides instantaneous spindle speed changes upon the movement of the machine's single speed control lever. Spindle speed selection by the operator, using the headstock mounted preselector dial, is accomplished by means of a mechanical-hydraulic system. When the preselector dial is rotated to the desired speed calibration, a pair of coordinated selector discs is mechanically aligned in readiness to actuate a combination of four hydraulic shuttle valves. Once this is done, a touch of the lathe's speed control lever causes the shuttle valve to direct oil pressure to the particular hydraulic clutches in the headstock required to produce the preselected operating spindle speed. Spindle is equipped with an 8-in. American Standard type "A-1" flanged nose. Six reversible power feeds—cross and longitudinal—are provided with automatic feed trips in the feed apron.

Twelve spindle speeds, or 24 unduplicated spindle speeds with a two-speed motor, in a 62.2 to 1 overall range, are standard on both the No. 4 and No. 5 universals. Speeds on the No. 4 are 30 to 1866 rpm with a 15/7½ hp drive motor; while the No. 5 provides 25 to 1556 rpm with a 20/10 hp drive motor. The No. 4 lathe swings 18⅛ in. over the bed and 9½ in. over the cross slide. The larger No. 5 machine swings 20 in. over the bed and 10¼ in. over the cross slide. *Warner & Swasey Co.*

Circle 37 on postcard for more data

Flat Finishing

IN order to meet the growing need for flat finishing equipment, a new machine especially designed to meet high production requirements for both shallow and deep draw operations, has been developed. One typical example is a unit recently installed in the plant of an automotive parts manufacturer. In this instance, the customer's problem is the deep drawing of bumpers from stock ranging from 0.075-in. to approximately 0.125-in.

Not only are the draws deep, but they also present very severe radii. For that reason, a phosphatizing operation is included. For shallower drawing operations the phosphatizing section is not required. In this specific case, the following method is employed: First, a short wash and rinse precedes the phosphate section, followed by another short rinse, then by a pre-heat oven. This raises the temperature of the metal sheets to the correct degree for applying the soap coating which follows. The soap coater has two steam-actuated spray guns above and two below the conveyor. Controlled temperatures and proper positioning of these guns achieve a uniform coat of proper thickness, such thickness being variable. After soap-coating, the work is subjected to heated high pressure air, which removes any moisture, leaving only a dry film. The sheets can then be processed immediately, or stored for a period of time.

In the case here described, when company designers consulted with the phosphate supplier, they decided that a phosphate coating of sufficient thickness could be applied in 30 sec. A machine was then designed with a 30-sec phosphatizing cycle at 52 fpm., and with a variable speed drive permitting speeds from 26 to 80 fpm.

Length of this particular machine is 78 ft. A disc conveyor is used to carry work through, discs being staggered from shaft to shaft. All shafts extend through the walls of the equipment, and are mounted on bearings outside the machine housing. Drive sprockets, attached to each shaft, are driven by one or more electric motors. *Cincinnati Cleaning & Finishing Machinery Co., Inc.*

Circle 38 on postcard for more data

Improved Press Brake

KNOWN as the 24-A-412, a new model of the Connecticut press brake with 24-tons rated capacity has additional features, including all-steel gearing, front-operated variable speed drive, one-hp motor, and front-operated back gage. It will bend four ft of 12-gage mild steel over a ⅞-in. die.

The bed and ram are 48-in. long and the distance between side frames is 32-in. Stroke is 2-in. and adjustment of ram by means of enclosed worm-geared pitmans is 1½-in. Die space over bed is 7½-in. with stroke down, adjustment up, and gap is 6-in. deep. *W. Whitney Stueck, Inc.*

Circle 39 on postcard for more data

High-Production Two-Dip System for Small Parts

THE equipment illustrated is a two-dip system for the application and drying of a primer and a finish coat to small parts at a high production rate, and is said to produce a coating of uniform thickness that is drain-free and tear-free and to dry it in an atmosphere independent of ambient humidity and temperature. Reportedly the design factors for these results are the automatically controlled extraction angles and extraction speeds, and the drying in a forged draft controlled atmosphere. Air-conditioning equipment and auxiliary drying ovens are stated to be no longer needed to effect quality set coatings. This dip coating technique is usable for the application of protective or decorative coatings of lacquers, enamels, paints or varnishes, as well as various types of plastic coatings.

The specific unit illustrated is 13 ft high and occupies 28 by 10 ft of floor space overall. Special chain attachments permit one operator to load and unload work carrying racks on the internal dual chain conveyor. Lift doors give access to removable dip-tanks for servicing. Recirculation of coating materials in the tanks provides dispersion of pigments. Overflow drains, part of the recirculation system, are said to assure maintenance of constant level and removal of trapped air. Modification of the basic design principles to meet special applications can be provided. Engineering services are available to facilitate equipment and plant layout, including automatic work handling as well as for initiation of production operations. *Applied Engineering Associates.*

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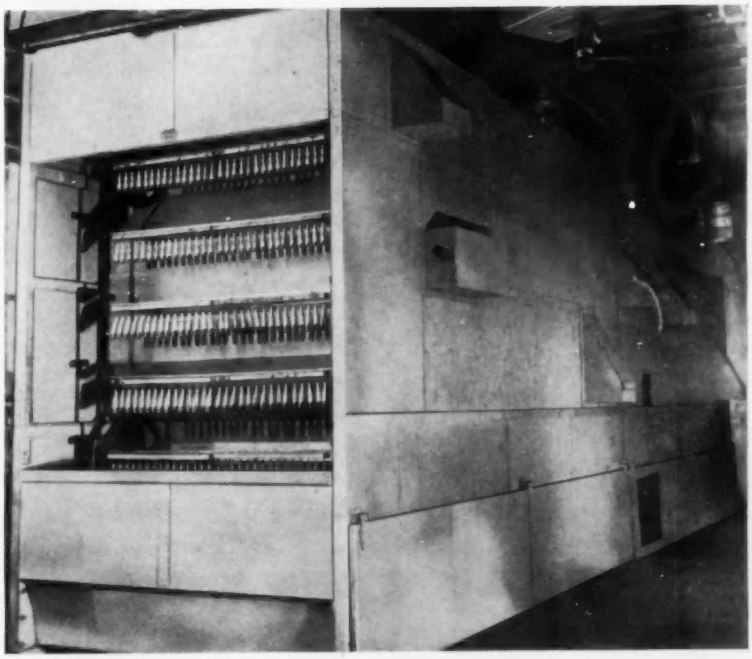


Front end of conveyorized dip-coating and drying system showing loading and unloading station. The dip tanks are removable through the lift doors on the lower right-hand side of the equipment.

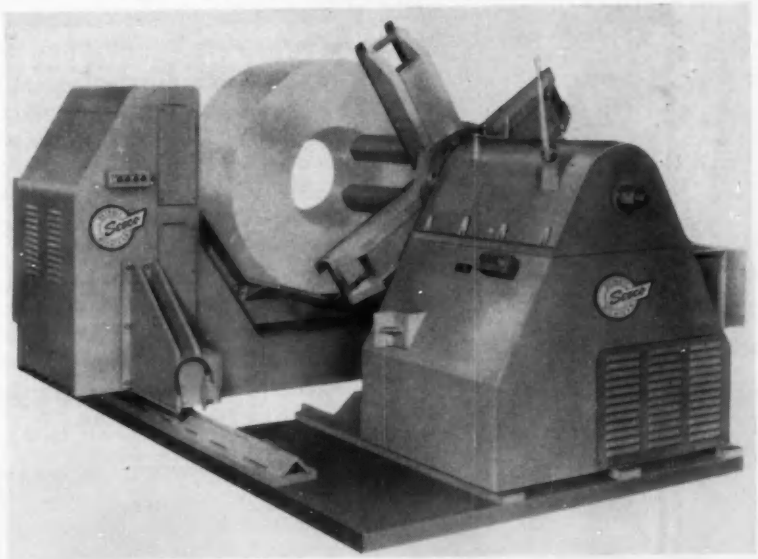
Cleaning Solvent

AN industrial solvent that is reputed to have cleaning properties closely resembling carbon tetrachloride, but up to 20 times less toxicity, is announced. Named Vinsol, it can reportedly be used with safety for most applications, including those in confined areas. In addition, it is non-flammable.

The material is recommended for removing oil, grease, wax and tars from hand tools, sheet metal, machine tools and other metal products. It is equally adaptable for cold cleaning, bucket cleaning and dip cleaning. *Speco, Inc.*

Circle 41 on postcard for more data

Power-Lift Coil Loader



The lateral movement of this new power-litt coil loader, called the Sesco Lift Loader, is said to be easily obtained as it is mounted on rails, thus permitting freedom for loading of coil. The coil is elevated to obtain core alignment and then is transferred laterally on to the expanded arms of the centering reel. The complete movement of the coil, both lateral and vertical, is by electric power and is push-button controlled. The model shown is designed for loading a single coil. However, the loader can be built to handle multiple coils and to specifications to handle coil weights up to 40,000 lb. (Sesco Inc.)

Circle 42 on postcard for more data

When your new design calls for

SEALING RINGS

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WHEN you are designing an automatic transmission, or power steering, or any other device requiring sealing rings, it will pay you to talk to sealing ring headquarters. That's Sealed Power.

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Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

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FREE LITERATURE

Speed Reducers 1

The Cone-Drive line of shaft mounted reducers features double-enveloping worm gear design to provide more load-carrying capacity. Bulletin CD-400 describes these reducers and includes complete specifications on bore sizes and gear mountings plus mounting instructions. All necessary details for motorizing reducers are also provided. *Cone-Drive Gears Div., Michigan Tool Co.*

Piston Inserts 2

"Keep Them Rolling," a four-page illustrated folder, covers the subject of piston groove inserts made of Ni-Resist austenitic iron. *International Nickel Co., Inc.*

Powder Metals 3

The processes used to manufacture electrolytic and reduced iron powders, and uses of these materials, are presented in 12-page bulletin No. 2 available from *Plastic Metals Div., National-U. S. Radiator Corp.*

Troubleshooter 4

The Model 1064 variable filter, in combination with IRD vibration analyzers, is for spotting chatter in grinders, eccentricity in turning and boring operations, bearing failures in high-speed machinery, and incipient troubles in all types of rotating machinery. Two-page descriptive bulletin is available from *International Research & Development Corp.*

Automatic Valves 5

Catalog 261, eight pages, describes solenoid-controlled, panel-mounted, four-way hydraulic valves which rate at full 3000 psi, may be mounted horizontally or vertically, and which are interchangeable in size. *Rivett Lathe & Grinder, Inc.*

Master Spacer 6

A new precision tool for accurately indexing work is described in a four-page folder which includes information on milling, drilling and inspection applications. *Erickson Tool Co.*

X-Ray Diffraction 7

Reprint of a one-page article explaining how some metallurgical problems are solved with X-ray diffraction and citing case histories is available from *Research & Control Instruments Div., North American Philips Co., Inc.*

Blind Riveting 8

A blind riveting system is described in an illustrated six-page folder recently issued by *POP Rivet Div., United Shoe Machinery Corp.*

Fan Clutches 9

The engineering features of electric fan clutches for use with internal combustion engines are discussed in a technical report issued by *Warner Electric Brake & Clutch Co.*

(Please turn page)

VOID After June 15, 1956 **4/15/56**

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Impact Extrusions 10

Applications of impact extrusions are described in a 32-page illustrated booklet, including those in power brakes, power window lifts, power steering, automatic transmissions, ignition systems and hydraulic brakes. *Aluminum Co. of America.*

Cemented Oxide 11

Two bulletins, one covering cemented oxide grade 0-30, the other the new finishing grade 330 carbide, are offered by *Carboloy Dept., General Electric Co.*

Slip Roll Formers 12

Technical data on a new line of slip roll forming machines designed for rapid forming of round and rectangular shapes is given in 18-page illustrated Bulletin 77 issued by *Niagara Machine & Tool Works.*

Wire Drawing 13

Continuous tandem wire drawing machines covered in eight-page circular 786-W-3 include the drum, block, and combination types for drawing brass, copper, aluminum and other non-ferrous metals. *Waterbury Farrel Foundry & Machine Co.*

Stainless Steels 14

Detailed information on stainless steels that use less nickel than the 300 series yet give high performance in many applications is provided in 10-page booklet offered by *Allegheny Ludlum Steel Corp.*

USE THIS POSTCARD

Hydraulic Valves 15

Bulletin A-5209 lists and illustrates special and standard hydraulic valves for airborne application. Included are constant gain nose wheel steering valves, anti-overrun flow control and constant speed valves for hydraulic motors, flow sensitive pressure regulators, and special high temperature in-line relief valves. *Vickers, Inc.*

Rubber Bonding 16

An eight-page brochure discusses the bonding of rubber (natural and synthetic) and silicone to metal. A new rating chart lists the latest materials that can be bonded to various polymers. *Acushnet Process Co.*

Aluminum Alloys 17

A full line of aluminum non-heat treatable and heat treatable alloys is listed in an illustrated 35-page catalog. Also included are aluminum sheet and extruded products, and seamless drawn tube, as well as fabrication. *Revere Copper and Brass, Inc.*

Hose Assemblies 18

Technical data on a complete line of automotive and commercial flexible hose and fittings is provided in 24-page Catalog 600. Illustrated are three typical examples of power steering hose assemblies. *Anchor Coupling Co., Inc.*

Industrial Photography

How industry is profiting by in-plant industrial photography is told in a 16-page illustrated booklet. Case histories of successful applications are cited. Address requests on company letterhead to *Graflex, Inc., 154 Clarissa St., Rochester 8, N. Y.*

Drill Bushing Chart

A pocket-sized slide chart that calculates the proper drill bushing for a given drill size is being offered to engineers who specify jig designs. Address request on company letterhead to *Universal Engineering Co., Dept. K, Frankenmuth, Mich.*

Surface Treating

A full line of machines for the surface treatment of metals is described in this 48-page illustrated catalog. Machines listed include tumbling barrel, conveyor and monorail types for washing, pickling, neutralizing, burnishing, rustproofing, descaling, deburring, polishing, surface treatment for paint base, paint spraying, flow coating, paint baking and foundry wet cleaning mills. *Write on letterhead to Ransohoff, Inc., North Fifth and Ford Blvd., Hamilton, Ohio.*

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The Engineer from Continental Screw Co. ...

... is specially trained to analyze your special fastener needs

Continental Screw leads entire industry in production of special fasteners

Continental is the only screw manufacturer that requires every engineer to have specific experience in the production of ground thread taps and gages. Continental knows that special training in this exacting field is necessary to give each job the skill and understanding it requires.

As a result of this specialized training, Continental produces more special fasteners than any company in the field. Over 6,500 different blueprints are turned out each week by Continental engineers. And the degree of accuracy is so great that Continental cold-forged fasteners are daily replacing expensive screw machine products, improving the product by increasing its strength while reducing its cost.

Why not put your special fastener needs in the most experienced hands. Continental's specially trained engineers are always ready to analyze your particular fastener needs. Call Continental today.

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NEW PRODUCTS
AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Oil-Hydraulic Motors

Constant speed motors with integral anti-overrun flow control are now available for use in aircraft oil-hydraulic systems. With the constant speed motor operating under overrun-

ning load, the unique flow control prevents uncontrolled runaway action or overspeeding of the motor in the event of cavitation. Motor overloading is also avoided because control is achieved by metering both inlet and return oil. The control further provides constant speed drive for either direction of motor rotation. Speed setting for each direction of rotation is individually established and controlled; forward and reverse speeds need not be the same.

Motors capable of providing up to 150 lb-ft of torque (86 hp) can be furnished with the new control valve. The smaller motors operate at recommended continuous speeds of up to 7200 rpm and at intermittent speeds of up to 9100 rpm. The units are designed for use with systems having operating pressures up to 3000 psi. *Vickers Inc.*

Circle 50 on postcard for more data

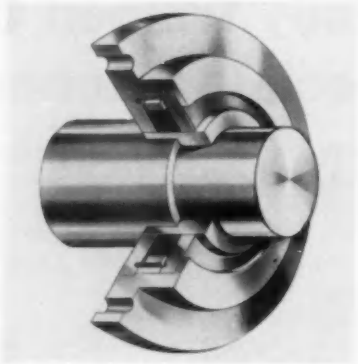
Printed Circuit Controls

A new line of carbon volume controls just announced is especially designed for simplified mounting on printed electronic circuits. Several models are available, including types for mounting directly on the circuit panel, self-supporting snap-in models for top of panel mounting, and threaded bushing types. All models incorporate a high stability resistance element which minimizes drift under severe temperature and humidity conditions, and provides low electrical noise level. They can be supplied with a new type of line switch that utilizes "floating ring" contact action to give long service life, and sharp make and break. A complete selection of resistance values and tapers is available. *P. R. Mallory & Co., Inc.*

Circle 51 on postcard for more data

Turbine Shaft Seal

Designed to function at temperatures as high as 1400 F and shaft speeds up to 150,000 rpm, this new seal is for high speed air and gas turbines. Improvements over conventional labyrinth type seals are claimed by the manufacturer, such as ability to seal interior pressures even where some eccentric shaft rotation is present. Thermal expansion of shaft does



not reduce the seal's efficiency, but is said to actually improve it.

Mechanical seals employ a rotating and stationary member. In this design the rotor moves axially and is free to float. A single or double stator is used (facing the rotor perpendicular to the shaft). Extremely close tolerances here contribute to the efficiency of this seal. Measured in millionths of an inch, these mating faces are lapped to flatness less than the molecular size of gas or fluid. Since there is no mechanical attachment between rotor and stator, internal pressures take care of adjustments. The same extremely close tolerance is applied for clearance between the shaft and the rotor. The rotor may be of carbon, ceramic or metal, depending on individual operating conditions. *Cartriseal Corp.*

Circle 52 on postcard for more data

Plastic Foam

"Cush-n-Foam," a new plastic foam for cushioning and sound-absorptive applications, is said to be six times stronger than foam rubber and to have twice the cushioning effect. It is also reported to be flame retardent; unaffected by temperature, climate and most dry-cleaning chemicals; and to be easily fabricated. *Hudson Foam Plastics Corp.*

Circle 53 on postcard for more data

Preformed Hose

Factory-preformed Teflon aircraft hose assemblies that eliminate the need for special elbows, can now be obtained. Known as Preformed Fluoroflex-T R3800 hose assemblies, the lines are permanently formed to clear obstructions and make connection in the shortest possible length. Preforming permits substantially smaller bend radii with minimum restriction of inside diameter when compared to unpreformed assemblies, it is claimed. By permanently preforming the hose during manufacture, stress and strain is eliminated in the critical bends and neat, efficient plumbing design is made easy, the company reports.

The hose has a —100 to +500F ambient temperature range, 1000 psi working pressure and inertness to all known oils, fuels and propellants. It has been approved by the Armed Services and CAA. *Resistoflex Corp.*

Circle 54 on postcard for more data

Switch With Memory

First of a new series is a toggle switch with an "electrical memory," comprising a four-pole assembly with one pole for indicating which circuit was last operated. The unit promises to simplify some basic circuit designs of complicated ground radar units, computer devices, air-

craft control panels and other types of remote control equipment, according to the company.

The switch assembly (designated 21AT1) uses three single-pole double-throw functional basic switches and one single-pole double-throw "memory" switch. In application, the memory switch indicates through a pilot light or buzzer which circuit was last actuated. The switch used for the "electrical memory," is actuated (maintained) in one extreme lever position and is released (maintained) in the other extreme position. The lever returning to the center position does not affect the memory switch, which indicates the extreme position in which the lever is in, or was in, most recently.

The basic switches are electrically listed by U/L at 5-amp, 125 or 250-v a-c. Their d-c rating at 30-v is: inductive—3-amp at sea level and 2.5-amp at 50,000 ft; resistive—4-amp at sea level and 4-amp at 50,000 ft; maximum inrush 15-amp. *Micro Switch Div., Minneapolis-Honeywell Regulator Co.*

Circle 55 on postcard for more data

Instrument Clamps

Light-weight mount clamps for aircraft instrument panels, designed for quick, easy installation and removal of instruments from the front of the panel, are offered in a new line. AN approved, the non-magnetic clamps are available in 1½, 2, and 3¼-in. sizes; are said to fit 1/16 to ¼-in panels without adjustment. Special sizes and configurations are also available.

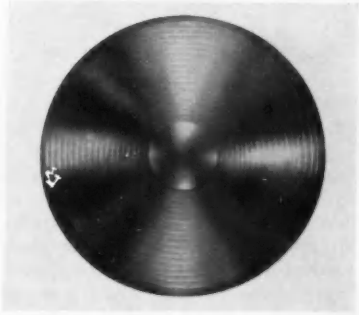
The expanded mount clamp fits behind the instrument panel and is attached with two screws. After the instrument is inserted into the panel a cam action on the master screw tightens the clamp around the instrument, locking it in place. *Marman Products Co., Inc., of Aeroquip Corp.*

Circle 56 on postcard for more data

Marker Lamps

Hermetically-sealed, throw-away lamps, for use as clearance and marker lights, have been introduced. They are said to meet or exceed SAE, ICC and state requirements. When a lamp is burned out it is easily replaceable with a new single sealed unit. Two parts only are claimed to facilitate installation and replacement. Being all-plastic, the lamp is rustproof and shatter-resistant.

It is designed specifically for high cube truck bodies. Face mounted



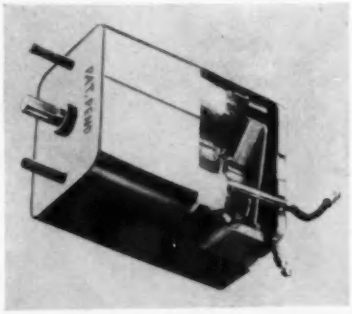
model is ⅝-in. depth, wired from exterior, and does not penetrate body. Flush mounted model protrudes ⅝-in. and penetrates body ⅝-in. The lamp unit is 2 cp, 1500 hours rated life, either 6 or 12-v. Beam candlepower output and edge lighting are increased by a unique design of acrylic lens. Lens diameter is 2½-in. Available colors are red, amber, green and clear. *Truck-Lite Co., Inc.*

Circle 57 on postcard for more data

Rectangular Motors

Rectangularly-shaped motors, designed to give the same output as comparable conventional round motors but in less space, are now being marketed. The new line is available in 6, 12, 24 and 32-v ranges, with outputs up to 140 oz-in. Initial applications will be for use in window regulators, seat adjusters, air conditioning units, and other areas where space is limited.

Rectangular construction is made possible by a unique design in which



the flux path is axial with the armature shaft as opposed to conventional motors whose flux path is concentric with the shaft.

The special flux path in turn is made possible by a special pole piece pattern.

Flexibility of installation is a feature of the new models, since the flat surfaces of the motors permit attachment of assembly bolts in any position. In addition, the shaft can be extended from both ends for double load application, the motors can be made waterproof, and sintered bronze shaft bearings eliminate the need for oil wick reservoirs. *Leece-Neville Co.*

Circle 58 on postcard for more data

Plastic Laminate

A new plastic laminate has properties suited for automatic production of electronic equipment utilizing printed circuits. Designated G-E Textolite (R) cold punch 11570, the new material is a high insulation-resistance XXXP phenolic, paper-base laminate which is said to permit close registration punching at normal room temperatures. The cold fabricating quality of G-E Textolite 11570 is reported to eliminate dimensional changes in the material which result from the combination of heat and punching stresses.

It allows precision punching of printed circuits, facilitating the use of automatic assembly equipment in mounting components. The translucency of the material permits a visual check for accuracy of circuit registration. Other features include high flexural strength, very low power factor, high heat resistance, and uniformity.—*General Electric Co.*

Circle 59 on postcard for more data

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

Auto-Lite Sales, Earnings Rose Greatly in Year 1955

Consolidated net sales of Electric Auto-Lite Co. reached a record of $296,007,212 in 1955, compared with sales of $197,048,855 in 1954. Consolidated net earnings were $10,102,060, against $714,184, in 1954.

Sales to initial equipment customers in 1955 increased from $125,989,523 to $220,848,303. Sales to the automotive replacement market in 1955 also registered a substantial increase over 1954 with a total of $62,913,141, as compared to $54,272,145 in 1954.

AMC Denies It Plans To Drop Large Models

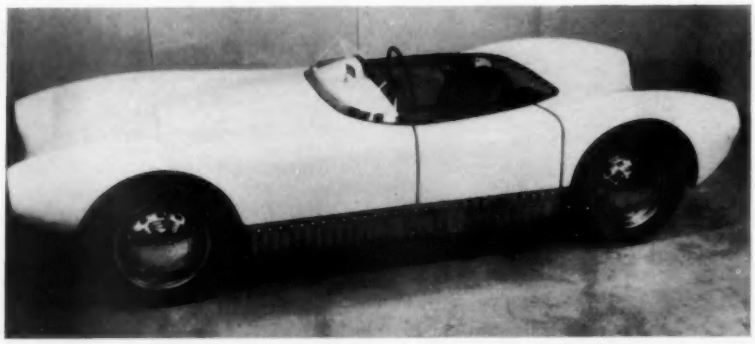
Reports that American Motors Corp. will drop the Ambassador and Hornet lines soon are inaccurate. While sales in these two lines have been disappointing, the company has no present plans to discontinue them in the near future.

List of Defense Suppliers Led By GM for Years of 1950-1955

Military equipment buyers are placing sizable demands on the productive capacities of America's large corporations, the latest Defense Dept. figures on its biggest suppliers reveal.

Three new lists of the 100 leading suppliers of military goods show the percentage and dollar value of prime contracts they signed in the five-year period ended June 30, 1955, and in recent two-year and six-month periods. Over the five-year stretch, these concerns received 62.6 per cent of prime orders, valued at more than $77.1 billion.

During the shorter periods, some major suppliers obtained an even higher percentage of prime contracts. They were awarded 65.4 per cent for $16.3 billion, from July, 1953 through June, 1955. From Jan. 1 through June 30, 1955, they received 68.4 per cent for $5.8 billion.



SPECIAL SAAB HAS PLASTIC BODY AND MORE POWER

The new Saab Sonett Super Sport experimental car is built primarily on the standard Saab 93 chassis (see AI, Jan. 1, p. 98). The car is powered by a Saab 93 engine, whose output has been boosted to 57.5 bhp at 5000 rpm. Maximum torque is approximately 63 lb ft at 3500 rpm, according to the producer's engine specifications.

Leading supplier for the five years studied was General Motors Corp., which with its subsidiaries signed contracts amounting to $6.8 billion.

It should be noted, however, that in the second list (July 1, 1953 to June 30, 1955) GM slipped to 21st place due to heavy cutbacks in orders for automotive and other heavy military hardware after the end of the Korean War. In the third list, for the period Jan. 1 to June 30, 1955, GM was in seventh position.

North American Aviation, Inc., which rose to the top of the lists in the two shorter periods, was sixth for the full five years, with $3.4 billion in orders.

Included in the top ten suppliers, besides GM and North American, are General Electric Co., General Dynamics Corp., and six aircraft companies. An additional ten concerns had orders of more than $1 billion each in the five-year period.

Boeing Sales in '55 Hit $853.8 Million

Boeing Airplane Co. has disclosed that its 1955 sales reached $853.8 million. Net earnings amounted to $30.3 million. Backlog at year-end totaled $2.62 billion, of which $351 million was in commercial aircraft orders.

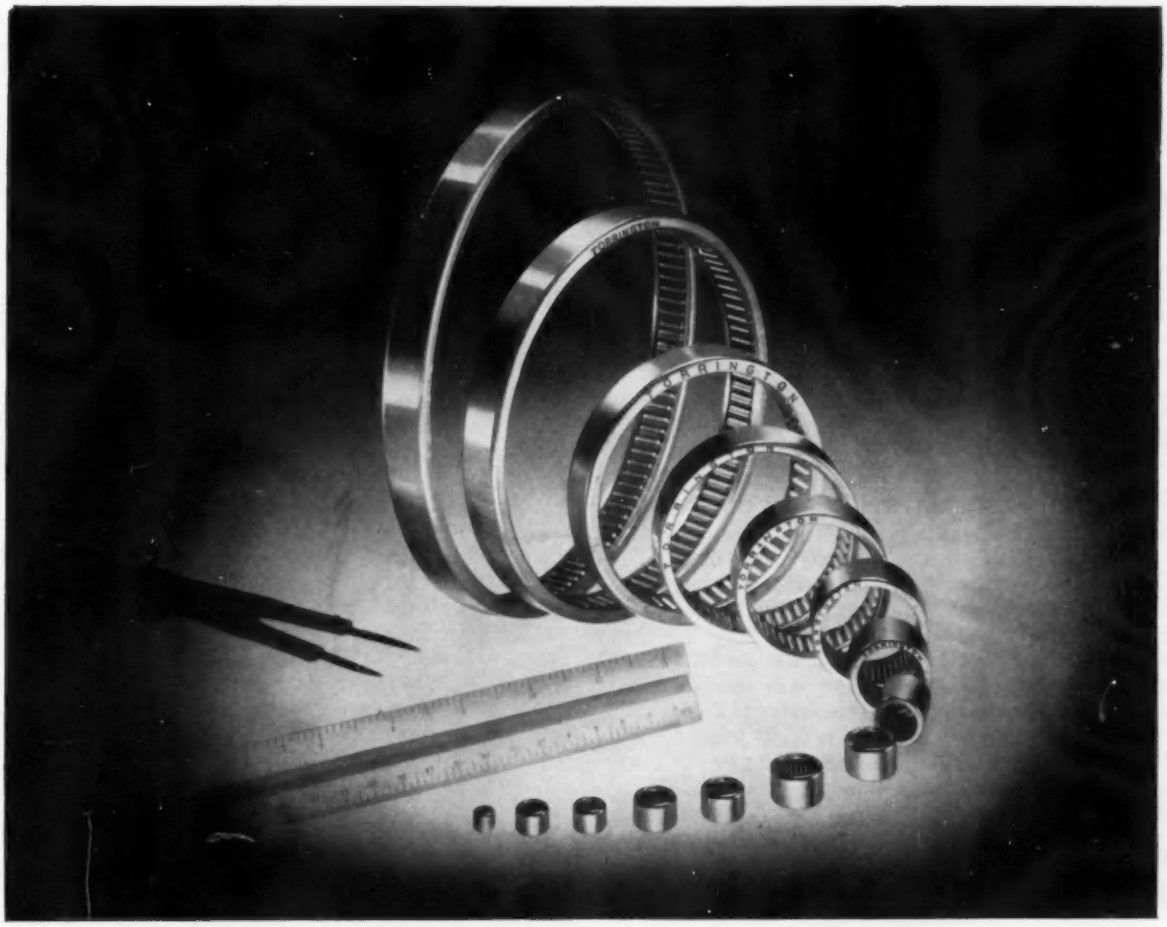
Control Of F. L. Jacobs Passes To Eastern Group

An ambitious expansion program, including diversification into the aircraft field, is being planned by the new owners of F. L. Jacobs Co. Control of the company passed to an eastern group last month after Edward Lamb, Toledo industrialist, turned down a 30-day option to acquire a majority of the outstanding common stock.

The eastern group acquired control of the company by purchasing the stock holdings of Frank E. Howard, former Jacobs board chairman, and associates. In addition to Howard, three others resigned from the directorate, which has been enlarged from seven to nine members.

Erratum

On page 79 ("Men in the News") of the March 15 issue of AUTOMOTIVE INDUSTRIES, it was erroneously stated that **Melvin C. Erickson** and **Paul W. Mantz** had been named chief engineer, and assistant sales and service manager, respectively, of Waukesha Motor Co. Actually, Mr. Erickson and Mr. Mantz are employed in the company's Railway Div., and their appointments were to positions within that division **only.**



"Look at the range of sizes of
TORRINGTON NEEDLE BEARINGS"

The Torrington Needle Bearing is produced in a wide range of sizes—for shaft diameters from ⅛" to 7¼"—to meet the needs of the thousands of products throughout industry in which it has become standard equipment.

Whatever the size, the basic design is the same—a full complement of free running rollers, without separators or cages, retained by a thin hardened outer shell which serves as the outer race. This means a greater radial load capacity for its size than any other anti-friction bearing, plus compactness and long, maintenance-free operation.

Several widths are available in each size to meet specific design requirements, and they are also made with one end closed for use over stub shafts.

The Torrington Company has engineered thousands of different Needle Bearing applications in many industries during the bearing's 20-year history. Our Engineering Department offers the benefits of this experience in applying Needle Bearings to your products.

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Give you these benefits

- low coefficient of starting and running friction
- full complement of rollers
- unequalled radial load capacity
- low unit cost
- long service life
- compactness and light weight
- runs directly on hardened shafts
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AIR BRIEFS

By RALPH H. McCLARREN

Gas Turbine For Electrical Power

To meet the increasing demands for electrical power in aircraft the Solar Aircraft Co. of San Diego, Calif., has developed an auxiliary power unit which is carried in a pod located under the body of the plane.

A Solar Mars 50 hp gas turbine engine operating at 38,250 rpm is the prime mover. Bevel gears are used to reduce the speed to 4500 rpm for the engines' accessory units and to 6000 rpm for the electrical generating unit. Adaptable for ac or dc the following continuous rated outputs are available: 115 volts ac, 3 phase, 400 cycles, 30 kva; 28 volts dc, 17 kva.

At 25,000 ft altitude, the ac rating drops to 24 kva; and overload rating for 5 minutes of 40 kva ac or 19.6 kva dc is provided.

Advantages of the power generating unit are its independence of the main engines of the aircraft and ability to produce electrical power when on the ground.

Lindbergh's Spirit of St. Louis

Three exact duplicates of Lindbergh's famous plane were made for the filming of Lindbergh's book, "The Spirit of St. Louis." One of these is going to be presented to the new United States Air Force Academy at Colorado Springs for permanent exhibit.

Subcontractors for Supersonic Bomber Production

Twenty-one companies, most of them in the aircraft industry, have been engaged to supply parts and components for the U. S. Air Force's new B-58 supersonic bomber. The bomber is now in initial production at Convair Division of General Dynamics Corp., Fort Worth, Texas.

Under the A.F. "weapon system concept" Convair has the responsibility for finding, developing, buying and installing items of equipment (except engines) which were previously furnished by the Government

The 21 firms are: Temco Aircraft Corp., Dallas, Texas; Menasco Manufacturing Co., American Tapered Wings Corp., Tapered Aircraft Products Corp., all of Los Angeles, Calif.; Ryan Aeronautical Co., Solar Aircraft Co., and Rohr Aircraft Corp., all of San Diego, Calif.; H. W. Loud Machine Works, Inc., Pomona, Calif.; Selb Manufacturing Co., Maplewood, Mo.; Merz Engineering Co., Inc., Indianapolis, Ind.; Ekstrom, Carlson & Co., Robert H. Brooks Co., of Rockford, Ill.; The Wheland Co., Chattanooga, Tenn.; Servel Inc., Evansville, Ind.; Cleveland Pneumatic Tool Co., Cleveland, Ohio; B. F. Goodrich Co. and General Tire and Rubber Co., both of Akron, Ohio; Fairchild Engine & Airplane Corp., Shawnee, Okla.; Bendix Aviation Corp., South Bend, Ind.; Steel Products Engineering Co., Springfield, Ohio, and Continental Can Co., of Coffeyville, Kan.

In addition to the special items supplied by the companies noted above some 1500 other firms supply items used in the production of the B-58.

Tenth Annual All-Women Transcontinental Air Race

This is one of the outstanding aviation events of the year. July 7, 8 AM (PST) is take-off time from San Mateo County Airport (near San Carlos, Calif.). Five o'clock (EST) PM, July 10 at Flint, Mich., is the finish deadline. This year it is expected about 50 light planes (race is limited to planes of 350 hp or less) carrying 100 women pilots and observers, will take off for the 2366 mile event.

It is not a speed event. Winners of the $2000 prize money are selected according to the ground speed achieved in relation to the 75 per cent throttle "par speed" of the aircraft. Consequently, good navigation and choice of altitudes for favorable wind and speed conditions rather than speed, will determine the winners.

Utility Aircraft Shipments

Personal and executive aircraft shipments during January and February 1956 from seven companies total 1085 aircraft at a manufacturer's net billing price of $14,991,000.

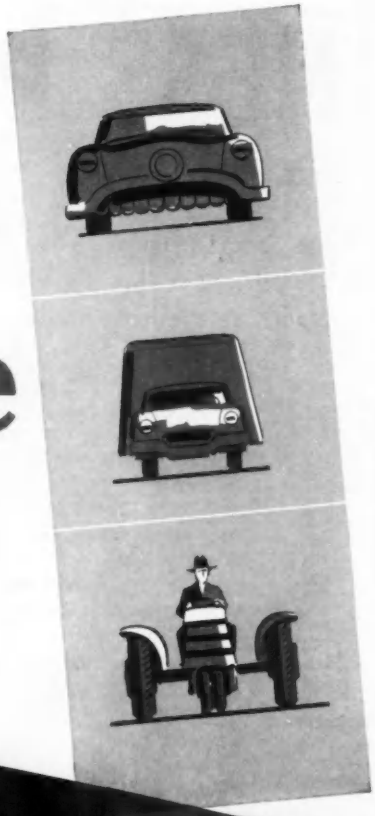
January shipments included 452 planes of four-place or more and 57 one and two-place aircraft, with total dollar value of $6,950,000.

February shipments were respectively 503 and 73, at a value of $8,041,000.

By companies the January-February shipments were as follows:

(*Turn to page* 117, *please*)

first choice



for modern cars, trucks and tractors

"No Kick-Out" feature combines new starting efficiency with proven economy

• Higher compression ratios, lighter flywheels and other advancements in modern engines have long pointed up the need of a starter drive that would follow through the weak explosions until the engine actually runs on its own power.

That's why vehicle manufacturers are turning in ever increasing numbers to the Bendix* Folo-Thru Drive as the solution to quicker and more dependable starting even under most adverse conditions.

This preference for the Bendix Folo-Thru Drive on modern vehicles is a most logical one, for Bendix Drives have always been the industry's choice as the most economical and efficient starting equipment.

*REG. U. S. PAT. OFF.

ECLIPSE MACHINE DIVISION of

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Bendix folo-thru starter drive

costs less. ***Like the more than 95,000,000 Bendix* Starter Drives manufactured for the industry, the new Folo-Thru Drive requires no actuating linkage and the solenoid may be placed in any convenient position. Result is lower installation costs and no adjustments. Complete detailed information is available on request.***

Bendix* Folo-Thru Starter Drive **Bendix* Automotive Electric Fuel Pump** **Stromberg* Carburetor**

The BUSINESS PULSE

President's Decision to Run Again and Increasing Business Investments Are Among Factors Which Have Contributed to Optimistic Economic Outlook. Upswing in Building Expected to Impart New Impetus to Business in General.

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Business Optimism Rises

The past month has witnessed a marked rise in business sentiment. Confidence, indeed, seems to be attaining the same state of buoyancy that prevailed last year when activity was advancing so rapidly. A variety of favorable developments have contributed to this result.

President Eisenhower's decision to seek a second term was certainly one of them. By and large, the business community obviously is appreciative of the direction which he has given to the Nation's affairs during his term of office and has relaxed a great deal, so to speak, now that a continuation of that direction for another term seems highly possible.

Another factor making for optimism was the disclosure that plans for business investment are being sharply upgraded, according to a joint survey conducted by the Securities and Exchange Commission and the Department of Commerce. For 1956 as a whole, the survey points to capital outlay by business of almost $35 billion, which, if realized, would be a resounding 22 per cent over capital expenditure in 1955. Significantly, the survey reveals that virtually all major industrial groups are expected to share in this rise. Strength is particularly noticeable in durable-goods manufacturing, where increases of more than 50 per cent over 1955 expenditure are being planned by automobile, iron and steel, nonferrous-metal, and non-automotive-transportation companies. Particularly heartening is the fact that such surveys, which have now been conducted for more than ten years, have established a record of rather high accuracy.

Consumer Outlook Good

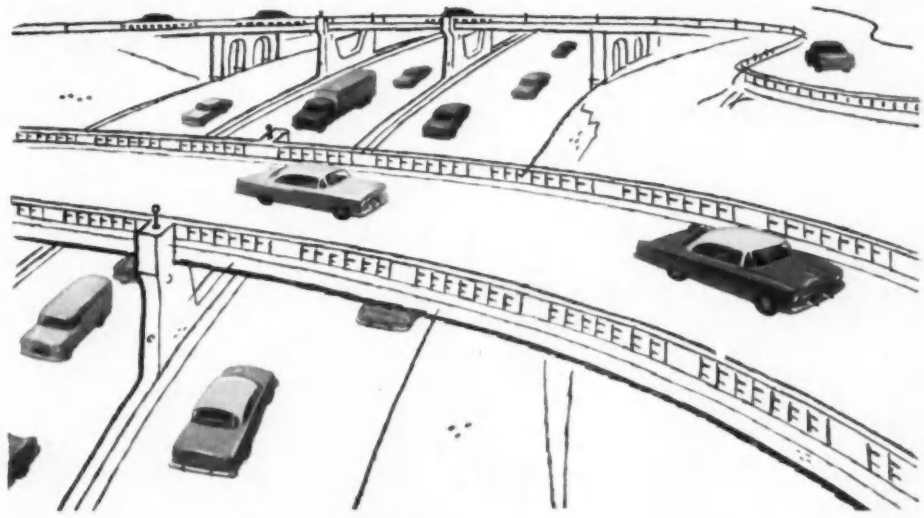
Also gratifying were the results of the Federal Reserve Board's annual survey of consumer finances and attitudes. While these results are by no means as clear-cut as the findings of the survey of investment intentions, they nevertheless are reassuring, for they indicate that the consuming public is optimistic about its own income prospects and very optimistic—in fact more so than in any previous survey year—about prospects for general business conditions.

It is true that the specific buying intentions of the people interviewed have not been upgraded from those reported a year earlier, but these individual findings tend to be regarded as of only limited significance, inasmuch as they have not always been borne out in a detailed manner in past years. For the time being, the disclosure of prevalent optimism among consumers has been seized upon as the truly significant feature of the survey. It has encouraged merchants to believe that the potentiality for buoyant and rising sales exists for 1956.

Observers have likewise been favorably impressed by the recent performance of the building industry. Only a few months ago building seemed to be emerging as one of the principal "soft spots" in the economy, but now the situation appears to have been radically changed. Some evidence of improvement actually began to show up in data for January activity. At the time there was no way of knowing whether this improvement was truly significant or whether it was merely a temporary situation. Now, with February data almost uniformly expansionary, the conviction is growing that building will soon be imparting new stimulus to general business. Housing starts are up, contract awards are up, and requests for Government-guaranteed financing are higher.

The effect of this series of favorable developments has been to push talk of a possible recession well into the background. Analysts are no longer as cautious regarding the outlook as they were at the beginning of the year. There is even some belief that the boom will be rolling again before long. The stock market testifies to this improving sentiment. Quotations have moved to new high ground, as is shown by a rise in the Dow-Jones industrial average above the 500 mark for the first time in history.

(*Turn to page* 178, *please*)



Every day, **EVANITE** separators are proving their advantages in day-to-day use!

Every day Evanite battery separators are proving their worth in severe, on-the-road service under all weather conditions. And every day these tough, durable separators are helping deliver the high performance demanded of batteries used in today's modern cars.

Here's what you build into *your* batteries when you specify Evanite—high uniform porosity, extremely high acid resistance, superior wettability, superior permeability, low web thickness, outstanding mechanical strength within the battery, resistance to abrasion and oxidation. You get all these, *plus* . . . because Evanite undergoes controlled swelling after insertion in the battery, resulting in a tight-fitting element that resists the effects of road vibration.

Better investigate Evanite today. Write Evans Products Company, Dept. P-4, Plymouth, Mich.—makers of the new Evanite high-performance, low-cost battery separator.

Plant: Coos Bay, Oregon. ***Sales Offices:*** Plymouth, Mich.; Coos Bay, Ore.; New York, N.Y.; Chicago, Ill.; Tampa, Fla.

EVANITE

is a registered trademark of Evans Products Company

EVANS PRODUCTS COMPANY also produces: Evaneer fir plywood; railroad loading equipment; truck and bus heaters; Evans bicycles and velocipedes

Twin Disc Clutch Co.
Adds New
Torque Converter to Line

WITH the addition of the new three-stage 13,800 Series torque converter to its line, the Twin Disc Clutch Co. now provides a torque converter for every horsepower range from 40 to 1000 —offering four sizes, with a total of 29 capacities, through internal blading variations. This series was designed to accommodate a large number of engines for which previous models were not ideally suited—particularly in the oil fields and in industrial locomotives.

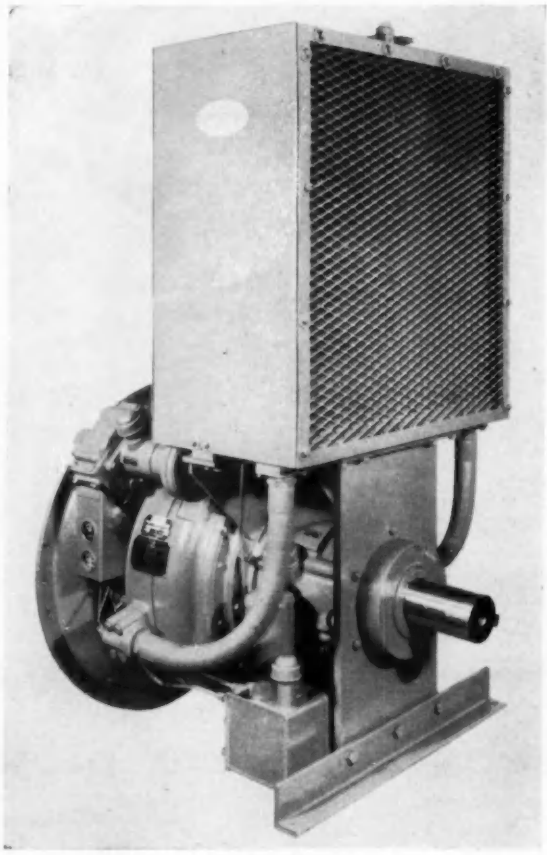
The new series is planned around a basic unit, with easy-to-add components which produce 10 specific models. This arrangement permits extreme flexibility and speedy interchange of components to provide a model specifically adapted to a wide variety of applications.

The torque converter provides two output arrangements. There is one standard output shaft assembly designed for maximum side pull loads up to the full capacity of the converter. On this particular type output shaft assembly, an output governor take-off is available. There is also one standard output flange designed for universal joint or flexible gear coupling drive.

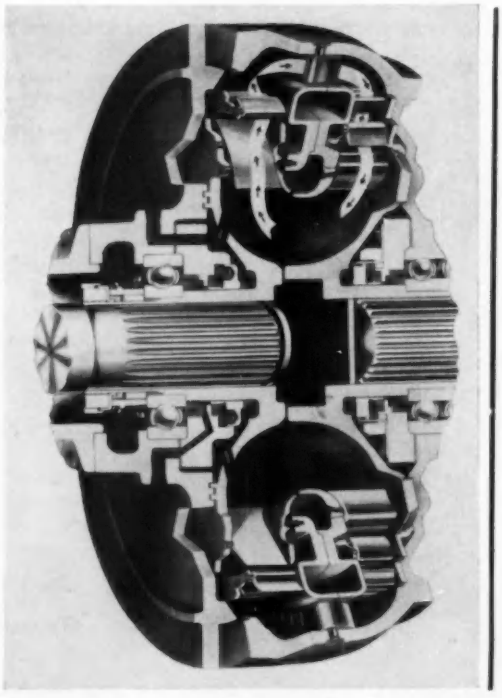
There are three input arrangements provided on the 13,800 Series. A spider drive, incorporating Twin Disc rubber block drive—which withstands normal misalignment conditions without imposing undue loads or stresses on the input shaft or the engine crankshaft; clutch assembly (which was designed by the Twin Disc Hydraulic Division for use on torque converter drives); and independent mounting. The 13,800 Series is designed to fit new SAE standard flywheels recently developed, and accommodate both Nos. 0 and 00 housing sizes.

In addition to being offered in 10 different models, this new torque converter can be adapted, with appropriate engine speeds, to all engines in the 60 to 600 hp range by internal blading variations—by either changing the blade angle or by varying the number of blades.

The 13,800 Series, as well as the 10,000, 11,500 and 16,000 sizes, of Twin Disc three-stage torque converter, provide up to 6:1 torque multiplication at stall; permit engines to work in their maximum efficiency range at all times; automatically match power to load demands; provide smooth, even pick-up of heavy loads without clutch-slippage; overloads, shock loads and vibrations are cushioned out, through fluid connection—and engine lugging or stalling is all but eliminated; and an infinite number of ratios permit accurate, positive control for delicate "inching" or "holding" under power.



Complete three-stage Twin-Disc torque converter



Cutaway view of the three-stage torque converter

BRIDGEPORT ALUMINUM EXTRUSIONS . . .

. . . help increase payload in Fruehauf's new Volume ★Van

Greatly increased payload – up to 34% in some cases – is the big "extra profit" feature of Fruehauf's new all-aluminum Volume Van. Backbone of this new trailer design is light, strong Bridgeport Aluminum Extrusions used extensively throughout the construction to trim body weight and make possible a tight, rugged, maintenance-saving assembly.

These trailer body shapes are typical of the high-strength extrusions Bridgeport is now producing for a wide variety of industrial and automotive uses. Bridgeport has the capacity of a large fully integrated producer and the flexibility of a small one. Modern extrusion facilities and complete die shops can produce standard or special shapes in both hard and heat-treatable alloys. And Bridgeport's staff of light metal specialists offers you prompt individualized help in developing practical, cost-cutting extrusion designs.

For the structural members in *your* assembly, consider the advantages of lightweight aluminum extrusions. Then call the nearest Bridgeport sales office.

Take advantage of Bridgeport's aluminum extrusions within these general limits:

Length—
Max.—Heat-Treatable Alloys 40 ft.
Max.—Aged 63S-T6 40 ft.

Weight per ft.—
Max.—50 lbs.
Min.—.250 lb.

Max. circumscribing circle — 16 in.

- Bridgeport has two large tool and die shops fully equipped for making all extrusion and forging dies.
- Complete facilities are available for mechanical, chemical and sonic testing of aluminum.

Bridgeport Brass Co.

For the very newest in

BRIDGEPORT ALUMINUM

EXTRUSIONS, DIE AND HAND FORGINGS

Bridgeport Brass Company, Aluminum Division, Bridgeport 2, Connecticut

Offices in Principal Cities

More Than Half of All Die Castings Used in Motor Vehicles

DIE CASTING SALES — 1955

(By Weight and Metal)

END USE INDUSTRY GROUPS	Zinc Estimated Pounds	Zinc Per Cent	Aluminum Estimated Pounds	Aluminum Per Cent	Magnesium Estimated Pounds	Magnesium Per Cent	Total Estimated Pounds	Total Per Cent
Mining, Construction and Agriculture Machinery	6,000,000	1.1	6,250,000	2.3	6,500	0.1	12,256,500	1.5
Motor Vehicles (except military)	327,000,000	59.6	117,000,000	43.3	1,950,000	37.5	445,950,000	54.0
Other Transportation (except military)	5,000,000	0.9	4,000,000	1.5	30,000	0.6	9,030,000	1.1
Machines and Tools	37,000,000	6.7	40,000,000	15.0	1,800,000	34.6	78,800,000	9.6
National Defense	3,500,000	0.6	7,000,000	2.6	550,000	10.6	11,050,000	1.3
Sub Total (Automotive and Machine Group)	378,500,000	69.0	174,250,000	64.7	4,336,500	83.4	557,086,500	67.5
All Other Industries	171,500,000	31.0	95,750,000	35.3	863,000	16.6	268,113,500	32.5
Total Sales	550,000,000	100.0	270,000,000	100.0	5,200,000	100.0	825,200,000	100.0

Note: Totals represent all job shop sales Captive use not included
Source: American Die Casting Institute

MOTOR vehicles consumed the lion's share of zinc, aluminum, and magnesium die castings last year. What makes the fact really impressive is that the figures for the industry do not include military production vehicles nor die castings made for captive use.

An ADCI (American Die Casting Institute) report on sales of job shop die casters shows that 59.6 per cent of zinc, 43.3 per cent of aluminum, and 37.5 per cent of magnesium die castings were purchased by the automobile industry. Of the three metals utilized for die cast functional and trim parts, 54.0 per cent was consumed by the motor vehicle group. In dollar volume, this amounts to approximately one-quarter of a billion dollars.

During 1955, the automotive and machinery industries bought over two-thirds of all die castings made by job shops in the U. S. Of the total 67.5 per cent, the machinery industries used 9.6 per cent and national defense consumed another 1.3 per cent, while 2.8 per cent was purchased for mining, construction, and agricultural machinery, as well as other forms of transportation.

Job shop die casting shipments represent about 67 per cent of the zinc and 77 per cent of the aluminum sold for die casting purposes. The balance represents captive production by end-product manufacturers.

According to the ADCI, 1955 set an all-time high for die casting production and sales. Major gains were noted in the automotive group in all metals. Job shop sales reached $457,500,000 which was 40 per cent over the previous high of $319 million recorded in 1953. Zinc die casting sales accounted for $232 million; aluminum die castings, $214 million; magnesium die castings, $6.5 million; and brass die castings, $5 million of the 1955 total.

• • •

ASQC Convention to Feature Automotive, Aircraft Papers

More than 90 speakers from the U. S., Europe, and Canada will address the forthcoming 10th Annual Convention of the American Society for Quality Control. Scheduled to be held in Montreal, Canada, from June 6 to 8, at the Palais du Commerce, it is expected to attract over 2000 delegates.

All phases of quality control, industrial statistics, and operational research will be covered in the talks. Six papers on the automotive industries and six on the aircraft industries are included in the program.

Titles of the former group are:

"Engine Manufacturing and Foundry Operations," I. A. DeGrote, Ford Motor Co.; "Statistical Approach to Gage Tolerances," H. C. Charbonneau, General Motors Institute; "Developing a Quality Control Program for Automation," B. P. Seipel, Studebaker-Packard Corp.; "Practical Quality Control in Motor Assembly and Machining," R. O. Tapler, Chrysler Corp.; "Quality Control in Automobile Frame Production," L. S. Eichelberger, A. O. Smith Corp.; and "Application of Quality Control in Manufacturing of Electrical Equipment for Use in Automobiles," F. D. Reardon, Electric Auto-Lite Co.

Aircraft papers include:

"Quality Control in Production Planning," W. Parish, Avro Aircraft, Ltd.; "Electronic System Failure Reporting Methods," R. F. Martin, North American Aviation Corp.; "Controlling the Quality of Bonded Panels — Honeycomb and Laminated Type" (panel discussion); and "Getting the Most Out of a Quality Control Budget," K. R. Willhite, North American Aviation Corp.

Present plans include some 40 to 50 exhibits to show recent developments in gages, calculators, and other devices. Many exhibits will show applications and new techniques. Plant tours through Montreal industries have also been arranged to provide examples of Canadian applications of statistical quality control techniques.

Watchmen over metals

Direct reading spectrographic analysis of metals obtained in minutes after being tapped from cupola or furnace.

Test heat of special alloy iron being poured in experimental laboratory.

Both raw materials and finished castings are given chemical tests to assure conformance to specifications.

Latest Technological Advances Help Maintain Precision Control Over CWC Castings

Precision control of the composition, finish, and properties of CWC castings is made possible by means of careful testing methods, thorough inspection and advanced metallurgical engineering. Metals are checked in the CWC special test foundry, radiographs are made by the million volt X-ray machine, analyses are made in minutes. Control at Campbell, Wyant and Cannon is as important a function as manufacture. Thus, volume production of many different types of grey iron, alloy iron, and steel castings is possible with the assurance of producing superior products at low cost.

Write for this booklet today!
Booklet, "One Source" tells how CWC's complete services—engineering, precision control and mechanized production—are the answer to your grey iron, alloy iron and steel casting requirements. Send for it now!

campbell, wyant and cannon

FOUNDRY COMPANY
MUSKEGON, MICHIGAN

CWC

SIX FOUNDRIES LOCATED IN MUSKEGON, LANSING AND SOUTH HAVEN, MICHIGAN . . . READY TO SERVE YOU.

New Diamond T Tractor Provides Extra Payload Capacity

DIAMOND T's new tractor Model 723CJT, which provides about 2000 lb of extra payload capacity under common legal restrictions, was developed expressly for highway haulers handling payloads in the 18-20 ton range with tandem axle semi-trailers. As a tractor, this Tilt-Cab model is rated for 60,000 lb gross combination weight, yet base chassis weight is only 9500 lb, of which less than 3100 lb is at the rear axle.

Chassis and cab dimensions permit the use of 35 ft square-nose "Hi-Cube" trailers in 45-ft limit states with ample freedom of kingpin positioning, even with vertical exhaust stack and guard. Bumper to back of cab is 76 in. and less than 84 in. with sleeper cab.

Model 723CJT is powered by the light-weight turbo-supercharged Cummins JT-6 Diesel engine. This power plant, with a piston displacement, is 401 cu in., develops 405 lb ft of torque, and 175 brake horsepower at governed speed of 2500 rpm.

Successful application of the JT Diesel in a full COE tractor is credited to the Dimand T Tilt-Cab design, which eliminates all former problems of accessibility. The complete cab, cowl and fender assembly tilts forward manually in a matter of seconds so that the entire front end area is "wide open" for inspection and service.

Additional to the JT-6 Cummins Diesel engine, major specifications include the Rockford 15 in. single plate clutch, Fuller 5A650 heavy-duty five-speed overdrive transmission, Timken FD-900 front, and Eaton 18803 two-speed rear axles, with Westinghouse air brake system. Frame side rails are of high-tensile steel with straight channel sections. The heavy-duty 12-volt electrical system includes 50-ampere generator and four large 6-volt batteries, with a total of 300 ampere-hours capacity.

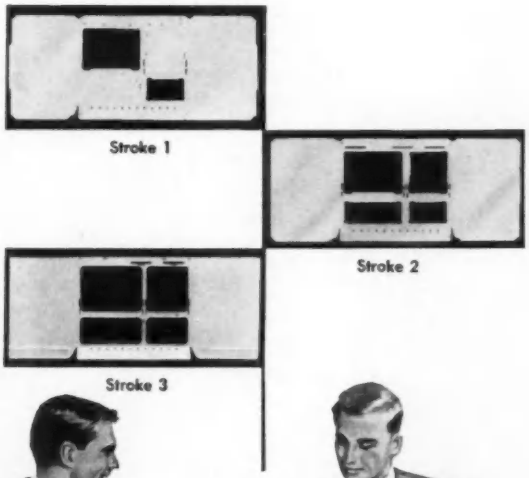
Standard wheelbase is 111 in., which provides 75 in. from rear axle to vertical muffler support and guard, and longer wheelbases are available for special conditions.

A wide range of options permits of tailoring Model 723CJT to meet operating requirements and owner preferences. The standard two-speed rear axle and 5A650 transmission provide for a top speed of 56 miles an hour with 10.00-22 tires, and afford good gear splits all the way up with particularly favorable short steps in the top gears.

(*Turn to page* 152, *please*)

Diamond T Model 723CJT tractor chassis, with saddle tanks, rear quarter fenders and fifth wheel.

1-2-3 STROKES OF A CLEARING TRANSFER FEED PRESS PRODUCE FRONT AND SIDES OF GENERAL ELECTRIC KITCHEN RANGES



Productive Efficiency? When you tool up with a Clearing transfer feed like the one shown here in General Electric's Louisville plant, the big jobs become easy. Blanks over seven feet long are automatically fed into this Clearing; three successive strokes and the front and two sides of an electric range come out the other end. Oven and drawer openings, hinge slots and corner notches are completed and base is formed on this giant 850 ton automatic press.

This is the kind of manufacturing know how that can put a finished range with all of its durability and sales tempting beauty within easy reach of the family budget.

If you want to tool up for speedier and more automatic production call in a Clearing man to talk about what a Clearing transfer feed can do in your operation. Get in touch with Clearing today.

By the way, Clearing has a new 16mm movie about a transfer feed press. Why not ask about it?

Can a transfer feed press like this Clearing lead to more profitable production for you?

Write for Clearing booklet "Thinking about a better way to do the job?"

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION *Division of U. S. INDUSTRIES, Inc.*

6499 W. 65th Street, Chicago 38, Illinois • Hamilton Plant, Hamilton, Ohio

ON OUR WASHINGTON WIRE

Value of the Government's stockpile amounts to $6.3 billion toward a goal of $11.2 billion. Buildup is now running only at about two per cent a year.

Wraps are being taken off large quantities of nuclear energy information following the review of more than 30,000 research reports by Atomic Energy Commission.

Companies with defense contracts are notified by the U. S. Renegotiation Board that they have until May 1 to claim the standard commercial article and service exemption. They must file at the same time their renegotiation reports for the year.

Companies in the market for subcontracts can pick up some valuable tips on seeking orders from prime contractors in a new Navy publication entitled "Selling to Navy Prime Contractors". Copies of the new pamphlet (Navexos P-1030) are being sold by the Government Printing Office, Washington 25, D.C., for 30 cents each.

Defense Dept. is making progress in its program to standardize equipment and supplies. For example, standards for fast-wearing internal combustion engine parts have been reduced from 2872 to 204.

Investigations in the development of forged and cast alloys for high temperature application performed by Allegheny Ludlum for Wright Air Development Center are described in a new report. It has just been released by Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.

Aircraft developments now in the making are expected to give the Air Force the nucleus of an all-supersonic bomber fleet within a few years. Work is in progress on one such high-speed bomber, the B-58, considered the likely successor to the medium-range B-47.

Bureau of Mines states that once-scarce columbium and tantalum minerals are now plentiful enough to meet all known civilian uses. They are important in jet engines and electronic equipment and for alloying steels.

Here's *usable beauty* for exacting service . . . wear-resistant, hard, bright and strong throughout! SUPERIOR STAINLESS forms smoothly and easily because it is uniform in every physical quality: facts proved by the mile in mouldings manufacture every day. • May we serve *your* stainless steel strip applications?

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

ONE "STOP" PROVIDES ALL...

-A COMPLETE STAMPING SERVICE!

Here at Ackermann-Wheeling, you will find skilled technicians capable of answering and carrying out the answer to any stamping problem – from drawing board to finished product. You'll find complete production facilities available: deep drawing, shearing, spot welding, arc welding, brazing, pressing, degreasing, painting ... everything needed to give your product a keen competitive edge. Write, wire or call for full details on Ackermann-Wheeling's services.

ACKERMANN WHEELING

ACKERMANN MANUFACTURING COMPANY

WHEELING, WEST VIRGINIA

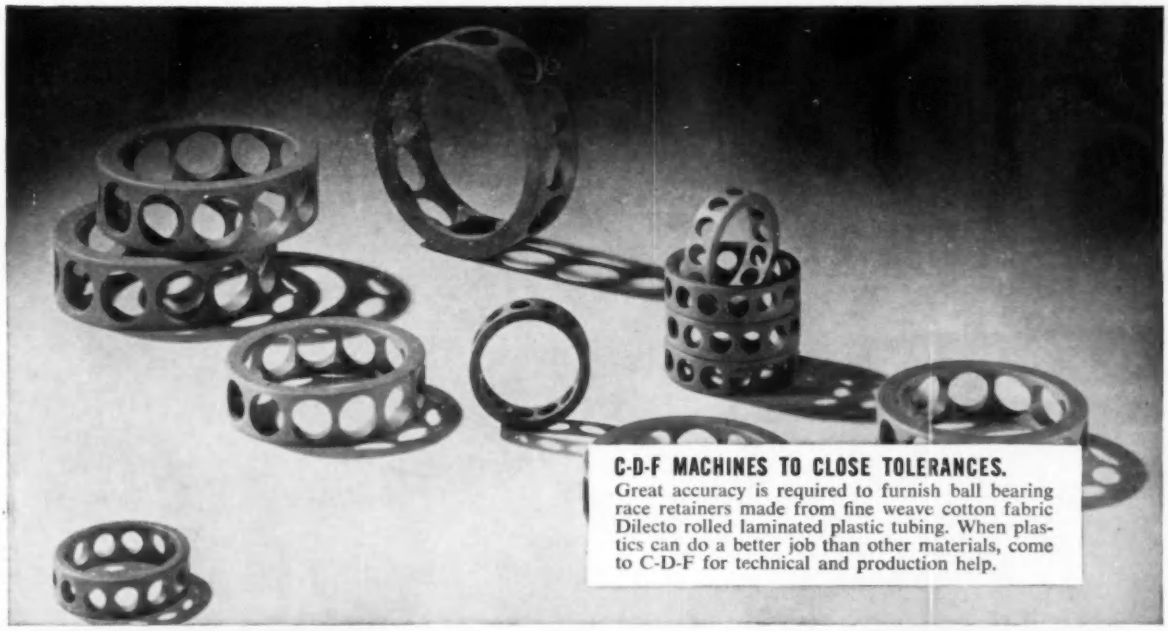
Steel Stamping does it better ... Ackermann-Wheeling does it best!

NOW... rounding out this complete service—

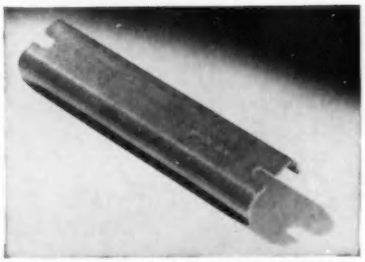
Ackermann BAND-BOX Steel Shipping Container...

to help you save on material handling!

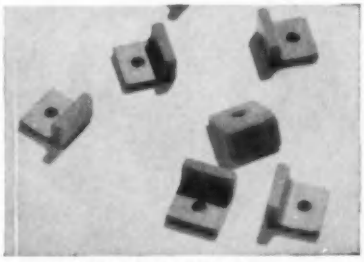
It's the ideal solution to in-plant and inter-plant shipping and storing. Rugged, all-steel yet light weight; nestable parts assemble in seconds; self-palletizing and tierable. It's the most practical, versatile shipping container available. Engineered to specific requirements. For full details on the Ackermann BAND-BOX write, wire or call today.



C-D-F MACHINES TO CLOSE TOLERANCES. Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



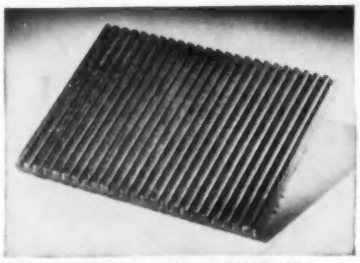
C-D-F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.



C-D-F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded *tubing* that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

Yes, C-D-F is a big reliable source for fabricated plastics!



C-D-F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.

C-D-F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.

C-D-F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

CONTINENTAL DIAMOND FIBRE

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 2, DELAWARE

It's not always possible to launder *all* the chips or filings out of ordinary wiping material. Chips come back to scar men and metal, to plague your production line. This man has already had four wiper cuts.

He had 4 wiper cuts last month

They're easy to distribute . . .

They really soak up oil . . .

Always a clean one handy . . .

Just toss 'em in the trash . . .

Chips can't hide in a clean Scott Wiper. Each Wiper is brand new, fresh from the carton. A man takes a Scott Wiper as he needs it . . . uses it for his face, his hands, his product.

. . . He had none!

The difference is . . . Scott Wipers

This is sanitary wiping. A man uses a Scott Wiper thoroughly, throws it away—takes a new one. No danger of cuts from hidden chips . . . no fear of skin infection from dirty wipers . . . when you take a fresh wiper from the carton.

And because Scott Wipers are disposable you save in many other ways. Sorting and baling are eliminated. Handling and distribution are simplified. Laundering becomes a thing of the past.

Put the Scott Wiper through its paces on your production line. Your local Scott representative or distributor is ready to demonstrate in your plant any time you say. Call him or mail this coupon right away.

SCOTT PAPER COMPANY
Dept. W-2, Chester, Pa.
Please send me more information about Scott "Throw Away" Wipers.

Name_____

Company_____

Position_____

Address_____

Purolator's "SELECTIVE" FILTRATION leaves additives in

Beneficial additives stay in as HD and heat-resistant lube oils pass through the Micronic® element of a Purolator filter . . . even though the element is straining out sludge, water and impurities as small as one micron (.000039-inch).

It's one of the reasons why original equipment manufacturers in the automotive field use more Purolators than any other make of filter. Besides this "selective" filtration, the accordion-pleated Micronic element provides ten times the area of older types, making possible:

- ***High flow rates with minimum pressure drop.*** **Purolators themselves can be small . . . yet operate with pumps of standard size.**
- ***Maximum dirt storage capacity*** **. . . for long, efficient service life before replacement.**

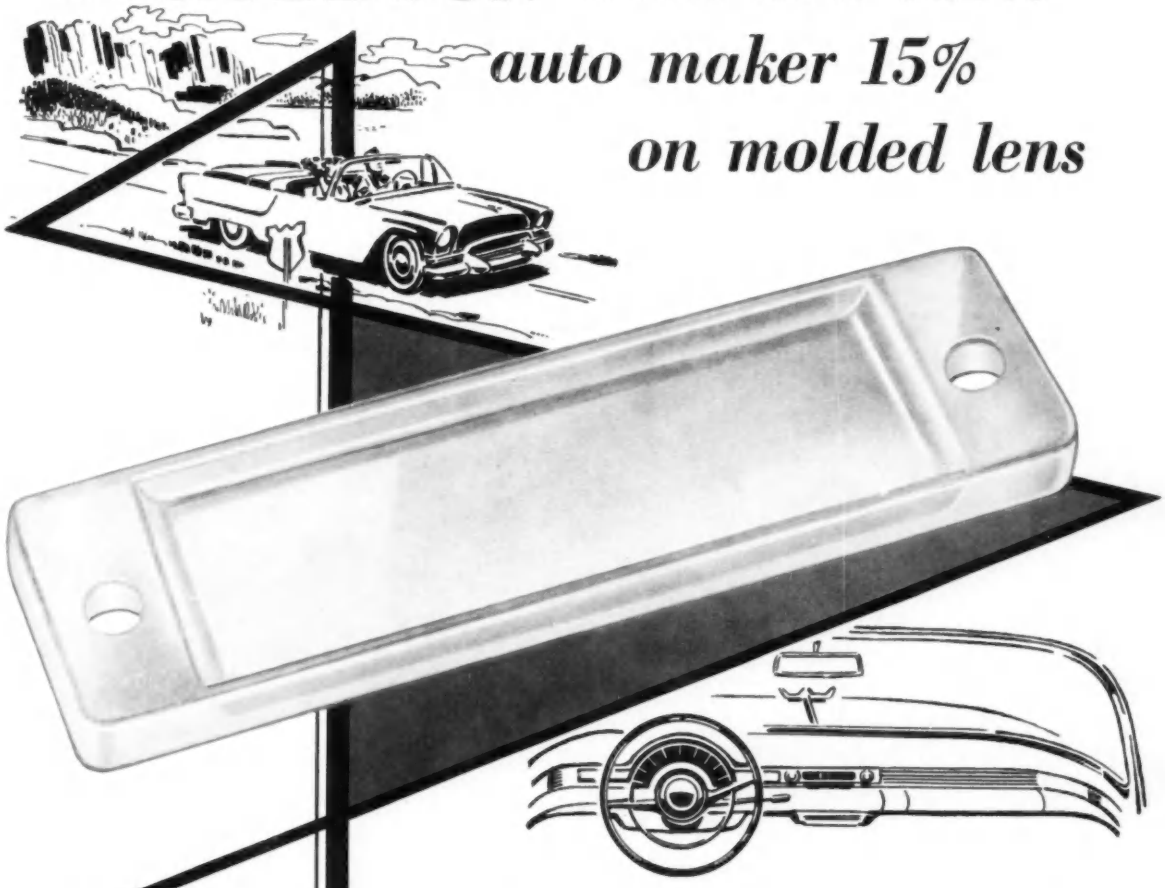
Micronic elements do not channel. They are waterproof and warp-proof and remain unaffected by engine temperatures. There's a Purolator to fit every vehicle, tractor and other gasoline- or diesel-engine-powered unit in service today. Write for our automotive catalog, No. 2054, to Purolator Products, Inc., Rahway, N. J., Dept. A5-412.

PUROLATOR

"FIRST IN THE FIELD OF FILTERING"

PUROLATOR PRODUCTS, INC., Rahway, New Jersey

RICHARDSON *know-how saves auto maker 15% on molded lens*



SIX PLANTS

Molded and Laminated Plastics

A well-known auto manufacturer required a clear acrylic molded lens for a dashboard map light. Richardson received the order, made the mold, and was ready to produce large quantities. At this point, the motor company changed the specifications to call for a translucent instead of a clear lens. To make this change, the customer suggested that Richardson sandblast the mold or sandblast the clear acrylic parts. Either process would have added to the cost of the lens.

Richardson engineers, with a wide background of experience and knowledge covering many different molding methods and materials, suggested instead a special light-diffusing polystyrene suitable for the application.

Lenses made of this material gave the desired lighting effect, and because of lower raw material cost, the customer received the improved lens at a saving of 15%.

Richardson engineers, with wide experience covering hundreds of plastics materials including the latest developments, would welcome the opportunity to discuss your plastics needs with the purpose of making similar savings for your company. Write or phone today. No obligation, of course.

The RICHARDSON COMPANY

FOUNDED 1858
2678 Lake St., Melrose Park, Ill. (Chicago District)
SALES OFFICES IN PRINCIPAL CITIES

New "triple duty" Danly Press

- Draws - Blanks - Forms

FINGERTIP GEAR CHANGE AND EXTRA LONG SHUT HEIGHT ADJUSTMENT PERMIT QUICK SHIFT FROM BLANKING TO DRAWING OPERATIONS...SOLVE SHORT-RUN STAMPING PROBLEM FOR LEADING HEATING UNIT MANUFACTURER

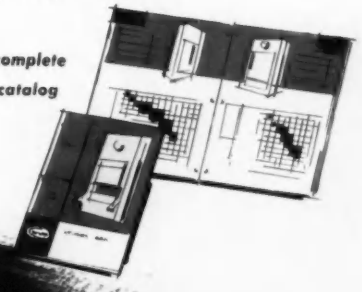
A leading manufacturer of home heating units needed a great variety of stampings . . . large blanks, drawn parts and deep formed pieces. Stamping these parts on a relatively short-run production basis would tie up entire lines of presses . . . unless one press could do the job. A specially designed Danly Press that blanks, draws and forms . . . and converts to these three types of operations quickly and easily . . . solved the problem.

Two unusual features give this "triple duty" Danly Press its unusual adaptability. First, the 24" stroke with a 30" range of shut height adjustment accommodates shallow blanking operations or deep dies for drawing and forming. Second, special gearing controlled from the master panel is easily changed to permit stroking at two speeds – one ideal for drawing, the other faster for blanking. Speed selection is controlled from the operator's station. The result: a "triple duty" Danly Press suitable for producing a tremendous variety of big stampings.

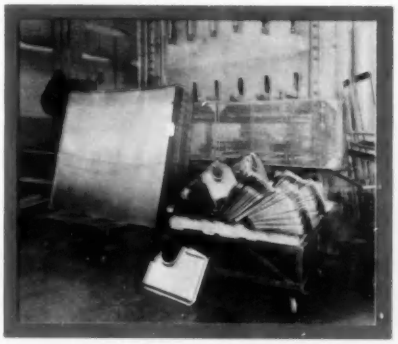
If your operation requires short production runs of a great many different kinds of stampings, Danly can help solve your production problem, conserve workhours and manpower. Danly presses will make your pressroom more efficient for your specific type of work. *Talk with a Danly engineer – soon!*

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

Write for complete single action straight side press catalog



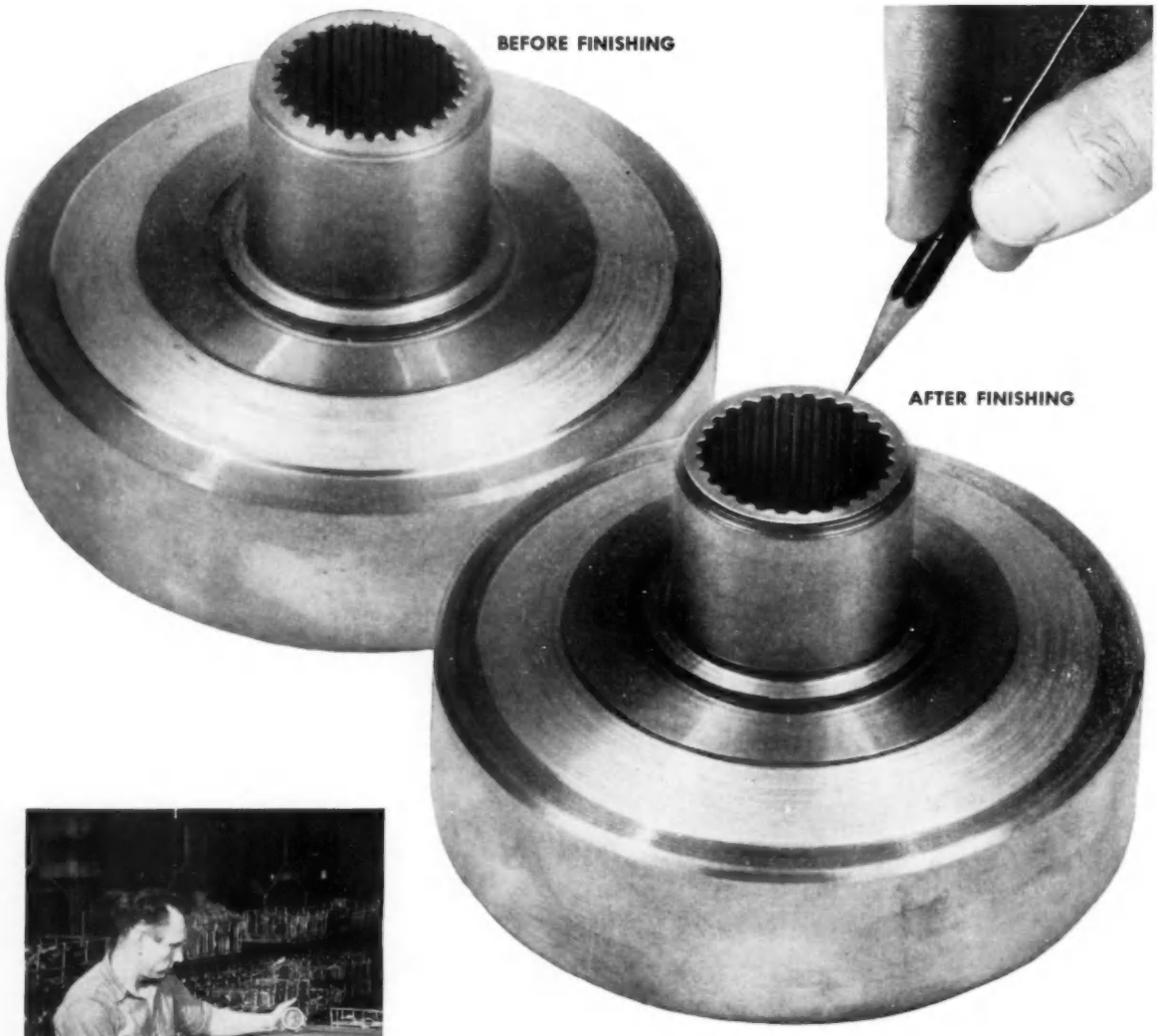
Stocks of parts produced on the specially built "triple duty" Danly Press. Note variety and size, particularly depth of form on V-shape stampings.



The contrast in these parts typifies the production problem solved by the Danly "triple duty" press.

An array of stampings like this would normally require several types of presses.

DANLY®



Osborn Brushamatic 3A removes burrs, blends and finishes surface junctures on end of spline in continuous run of 2000-2400 of these gears per day.*

5-second finish for gears

IN a major automotive plant, 5-second Brushamatic* finishing of this gear helps maintain a high daily production rate of 2000 top-quality automatic transmissions.

An **O**sborn **B**rushing **A**nalysis of your finishing operations will show how *you* can profit from Brushamatic finishing methods proved in automotive and other industries. Write *The Osborn Manufacturing Company, Dept. E-40, 5401 Hamilton Avenue, Cleveland 14, Ohio.* *Trade-Mark

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

AIRBRIEFS

(*Continued from page* 96)

Aero Design & Engineering Co..	16
Beech Aircraft Corp.	118
Call Air	2
Cessna Aircraft Co.	531
Mooney Aircraft, Inc.	6
Piper Aircraft Corp.	408
Taylorcraft, Inc.	4

$850,000 Jig For Wing Construction

So big that it requires a telephone communication system for production employes to use it, the jig permits the construction of a 150-ft long airplane wing, in one piece. Use of the jig saves time and expense compared to the six-section wing previously constructed. It is used for Lockheed's Super Constellation Model 1649 A at Burbank, Calif.

Built like a bridge structure, the jig cost $100,000 and is implemented with $750,000 of precision tools to make it a complete working unit. Errors of 0.001 in. in its structure or in the wing being manufactured can be detected and compensated for.

The one-piece wing is built in a vertical position. When complete it is separated from the jig, tilted to the horizontal and fastened to the fuselage of the four engined transport aircraft.

Use of Glass Plastics Saves Weight

A new glass fiber reinforced air storage sphere has been developed by the textile industry and the aircraft industry for use as air storage reservoirs. The air is used to actuate pneumatic devices on fighter, bomber and transport aircraft.

Weighing 8.5 lb less than its metal counterpart, the new plastic sphere will make a saving of 82 lb in one aircraft. Applying the standard rule of thumb that each pound of equipment adds 10 lb to the gross weight of the aircraft, there would be a net saving of 820 lb. At an airframe cost of $50 per lb the saving would be $4100.

Testing Structural Strength of an Airplane

Military aircraft are thoroughly and completely tested on the ground as well as in the air. The ground tests make certain its structure will withstand the flight loads — these being in some cases 12 to 14 times the weight of the aircraft. On a recent

AIRBRIEFS

(*Continued from page* 117)

visit to Lockheed Aircraft Co., Burbank, Calif., a special building was seen which housed the mammoth structure required to hold the airplane, apply the loads, record the measurements and reduce the data to usable figures. Loading was accomplished by hydraulic cylinders. Deflections were measured electrically and an electronic computer was in use to record and compute the measured values.

The Aircraft Industries Association advises us that the testing of one integral structure of a new Air Force bomber required 14 months and the use of 110,000 engineering man-hours and 430,000 shop man-hours to complete the tests.

Military Air Travel

Operation of MATS (Military Air Transport Service) is big business. During 1955 their 1500 aircraft logged 1,180,000 flight hours, carried 733,400 passengers and 139,000 tons of high priority cargo, and did so with an all time safety record. According to MATS officials an average of 83 military passengers and 16 tons of cargo were airlifted every hour of the year. A regularly scheduled or special air mission of the global military air transport service made an Atlantic or Pacific crossing every 32 minutes.

Encourage Youth for Careers in Science and Engineering

"Fostering of engineering education is everybody's job," said Joseph T. McNarney, president of Convair Division, General Dynamics Corp., speaking before a meeting of 600 San Diego area engineers and their wives. He suggested as an aid to overcome the lack of technically trained men a five point program:

1. Provide summer and part-time employment for science teachers.

2. Enlarge industry supported scholarships.

3. Increase industrial supported research projects at universities and institutes.

4. Encourage technical societies to intensify programs to interest youth in science and engineering.

5. Industry should re-evaluate its use of scientific personnel — use trained technicians to release them from routine work.

Extra Rugged...

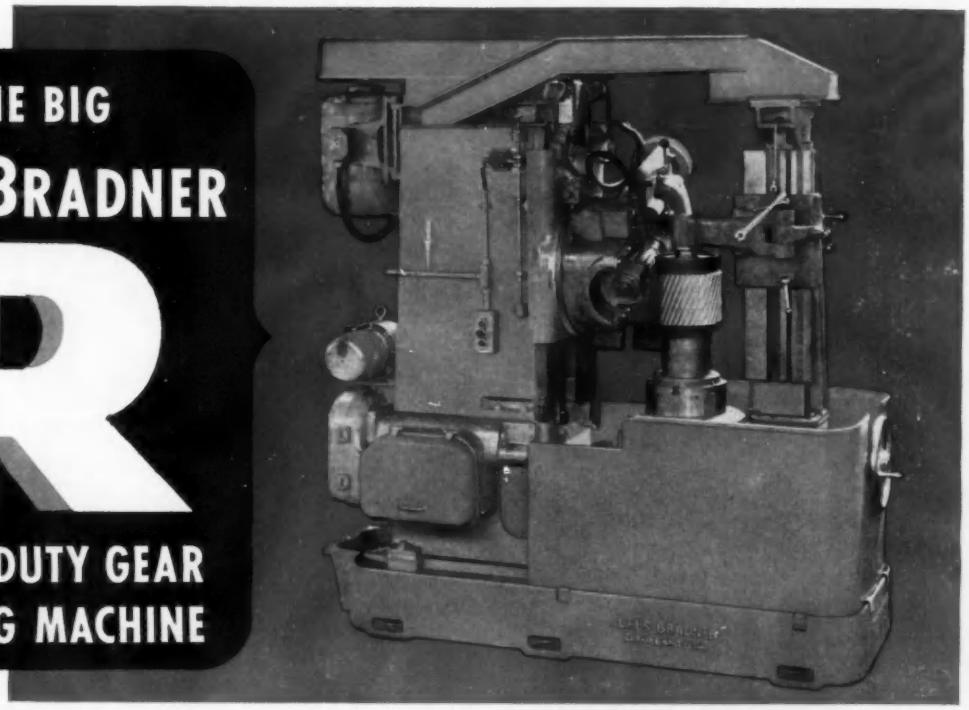
For The ROUGH Hobbing Jobs!

THE BIG

LEES-BRADNER

R

HEAVY-DUTY GEAR HOBBING MACHINE



Built rugged and reliable to handle those rough, tough gear hobbing jobs . . . that's the new Lees-Bradner Model "R".

It's designed to hob spur or helical gears up to 1¼ DP with a left or right hand maximum helix of 45°.

The Model "R" features fast loading and unloading, ready access to index and feed change plus easy operation and maintenance.

Write for your free brochure giving the detailed capacities and specifications of this new heavy-weight hobbing machine.

SPECIFICATIONS

Maximum outside diameter with tailstock column	16"
without tailstock column	18"
Minimum C/D hob to work	1½"
Maximum C/D hob to work	12"
Travel	18"
Maximum diameter of hob (3-1, 6-1, or 12-1 backgearing)	10" x 10"
DP range	1¼ DP to 16 DP
Maximum manual (or electric) shift of hob	6"
Diameter of hole through work spindle	2"
Machine weight	13,000 lbs.

the **LEES-BRADNER** *Company*

CLEVELAND 11, OHIO • U.S.A.

More Government Contract Awards

THIS latest list of Govenment prime contracts that have been awarded covers the period from Feb. 28 to Mar. 26, 1956. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

AEROQUIP CORPORATION, Jackson, Michigan
Hose assys.—various—$28,023

AINSWORTH MANUFACTURING CORP., Detroit, Michigan
Auto parts—3257 ea.—$110,442

AIRESEARCH MANUFACTURING CO., Los Angeles, Calif.
Kit to rework turbine—5 items—$99,495

ALLIS - CHALMERS MANUFACTURING CO., Buda Div., Harvey, Ill.
Diesel electric sets—2 ea.—$52,024

AMERICAN BOSCH ARMA CORP., American Bosch Div., Springfield, Mass.
Actuator assy.—300 ea.—$28,536

BEECH AIRCRAFT CORP., Wichita, Kansas
Tank, hood, pinion and gear assy.—$129,410
Airplanes—133—$3,694,116
Propeller assemblies—$160,985

BELL AIRCRAFT CORP., Helicopter Div., Fort Worth, Texas
Helicopters, winterization kits—$618,150

BENDIX AVIATION CORP., Sidney, New York
Parts for magnetos—various—$160,212
Magnetos and distributors — various—$135,444
Parts—various—$35,526
Magneto coils—various—$25,414
Parts—various—$134,208

BOEING AIRPLANE COMPANY, Wichita, Kansas
Installation kits—$1,732,416

CESSNA AIRCRAFT COMPANY, Wichita, Kansas
Airplanets—$688,894

CHAMPION SPARK PLUG CO., Toledo, Ohio
Spark plugs—37,425 ea.—$49,027

CONTINENTAL AVIATION AND ENGINEERING CORP., Detroit, Mich.
Facilities for engines and gas turbine air compressors—$199,200

CONTINENTAL MOTOR CORP., Muskegon, Michigan
Engine spare parts—659 ea.—$52,652

THE DAYTON RUBBER COMPANY, Dayton, Ohio
Tire—2036 ea.—$49,739

FARGO MOTOR CORP., Washington, D. C.
Trucks—73 ea.—$172,695

FORD MOTOR CO., Ford Div., Washington, D. C.
Automobiles—199 ea.—$249,825
Trucks—441 ea.—$743,767

GENERAL DYNAMICS CORP., Convair Div., Fort Worth, Texas
Maintenance of aircraft—$4,153,852

GENERAL ELECTRIC CO., Cincinnati, Ohio
Overhaul turbo-jet engines—$1,139,337
Modification and repair engines—job—$396,968
Overhaul of engines—job—$7,294,021

GENERAL MOTORS CORP., Allison Div., Indianapolis, Ind.
Transmission assy.—11 ea.—$202,950
Overhaul of engines—job—$1,222,000

GENERAL MOTORS CORP., Allison Div., Dayton, Ohio
Propeller assembly—$102,180
Propeller and spares—$5,500,000

GENERAL MOTORS CORP., Chevrolet Motor Div., Detroit, Mich.
Automobiles—328 ea.—$276,644
Trucks—562 ea.—$880,305

GENERAL MOTORS CORP., Cleveland Diesel Engine Div., Cleveland, Ohio
Parts for engines—various—$64,030

GENERAL MOTORS CORP., Detroit Diesel Engine Div., Detroit, Mich.
Parts—15,200 ea.—$116,096

GENERAL MOTORS CORP., GMC Truck and Coach Div., Pontiac, Mich.
Parts—31,490 ea.—$155,016

THE B. F. GOODRICH COMPANY, Akron, Ohio
Brake assys.—1453 ea.—$228,194

(*Turn to page* 122, *please*)

(*Continued from page* 120)

THE B. F. GOODRICH CO., Tire and Equipment Div., Troy, Ohio
Wheel and brake system—$49,261

THE GOODYEAR TIRE & RUBBER CO., INC., Akron, Ohio
Brake lining—various—$63,786
Brake assemblies, aircraft—$270,093
Wheel assys.—629 ea.—$75,908
Brake assemblies—1200 ea.—$637,188

GRUMMAN AIRCRAFT ENGINEERING CORP., Bethpage, New York
Aircraft—$6,227,417

HAMMOND MANUFACTURING CORP., Pasadena, Calif.
Trailers—$581,532

HOLLEY CARBURETOR COMPANY, Van Dyke, Michigan
Fuel controls—898 ea.—$1,088,196

INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks—126 ea.—$422,342

INTERNATIONAL HARVESTER EXPORT CO., Chicago, Illinois
Mobile vans—27 ea.—$97,626

KENWORTH MOTOR TRUCK COMPANY, Seattle, Washington
Truck-tractor—1 ea.—$20,199

KOEHLER AIRCRAFT PRODUCTS CO., INC., Dayton, Ohio
Valve assembly fuel—2 items—$67,399

THE LEECE-NEVILLE CO., Cleveland, Ohio
Stator assy. and brush assy.—1016 ea.—$49,135

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
Airplanes—47—$56,400,000

LOCKHEED AIRCRAFT CORP., Marietta, Georgia
Modification of aircraft—job—$2,000,000

LOCKHEED AIRCRAFT SERVICE-INTERNATIONAL, Jamaica, New York
Maintenance of aircraft—$153,690

McDONNELL AIRCRAFT CORP., St. Louis, Missouri
Parts—various—$382,885

NORDBERG MANUFACTURING COMPANY, Milwaukee, Wisconsin
Parts—650 ea.—$51,908

NORTHWESTERN AERONAUTICAL CO., St. Paul, Minn.
Overhaul aircraft engines—$158,158

PACIFIC CAR & FOUNDRY CO., Renton, Washington
Modification of vehicles—various—$99,270
Service brake, hub, jackshaft—various—$27,523
Axle assembly—various—$327,918

THE PARKER APPLIANCE CO., Cleveland, Ohio
Packing rings—1,327,250 ea.—$141,654

PRICE BATTERY CORP., Hamburg, Pa.
Battery, storage—$72,253

READING BATTERIES, INC., Reading, Pa.
Battery—$831,419

REPUBLIC AVIATION CORP., Farmingdale, New York
Repair of aircraft—1—$92,827

ROBERTSHAW-FULTON CONTROLS CO., Aeronautical Div., Anaheim, Calif.
Fuel valves—731 ea.—$149,857

ROVER COMPANY, Birmingham, England
Trucks—18 ea.—$29,552

STRIBLING BROS. CORP., Greenwood, Miss.
Tractors—5—$100,313

(*Turn to page* 126, *please*)

Imagineering the 195X models... in Alcoa® Aluminum

Heavy-duty part made 50% lighter

A heavy truck highballs down the road and WHAM it hits a big chuck hole. But the dual drive axle has a Hendrickson suspension. Two equalizer beams keep all four wheels against the road. Road shock is cut in half.

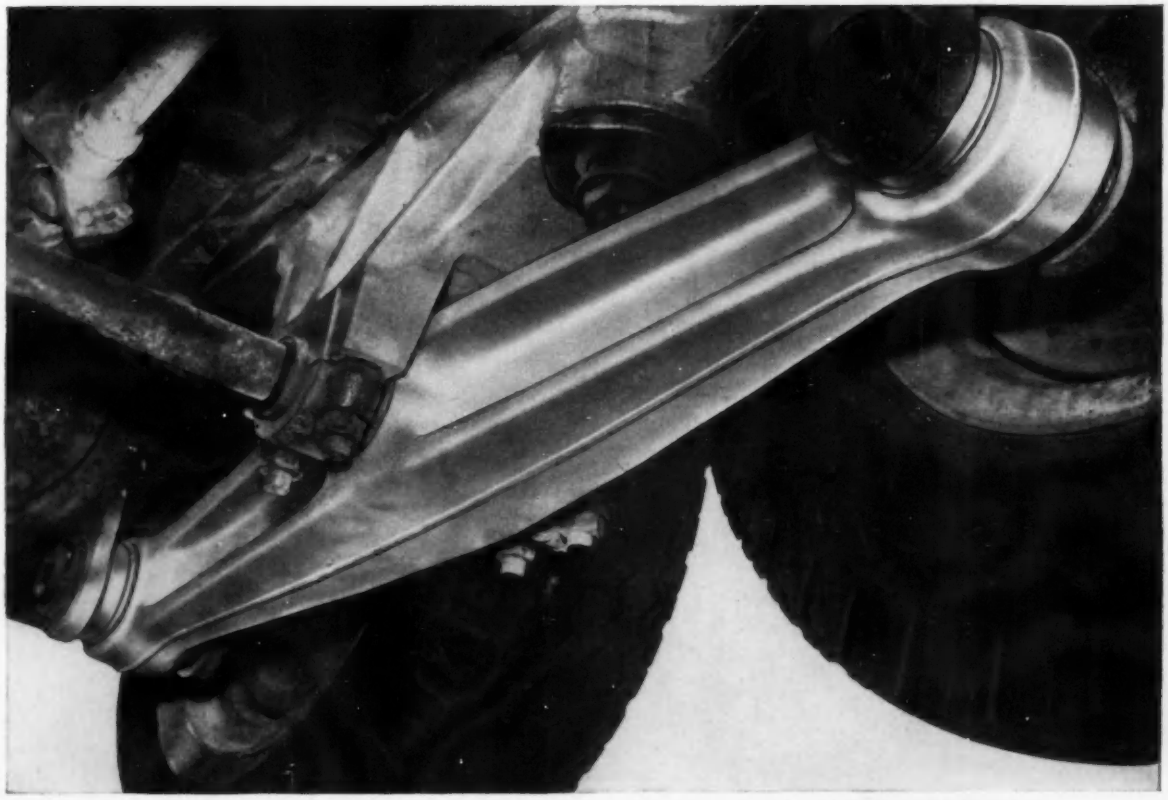
These equalizer beams must withstand heavy loads, jarring impacts and pounding vibration for hundreds of thousands of miles. Hendrickson was using forged steel beams weighing 120 lbs apiece (all unsprung weight). That's when Hendrickson began to imagineer in Alcoa Aluminum, a practice we commend to all. They called us in.

Alcoa Development Division engineers first made stress analysis studies of the steel beams. Placed in a testing machine, the beams were precisely loaded to determine the points and values of high stress and also the breaking load. Then, after mathematical analysis, our engineers designed a forged aluminum beam. Prototypes were hand-blocked and finish-forged.

The aluminum beams weighed only 60 lbs apiece, a 50% weight saving—120 lbs per vehicle. Now if they could take the loads and the pounding . . .

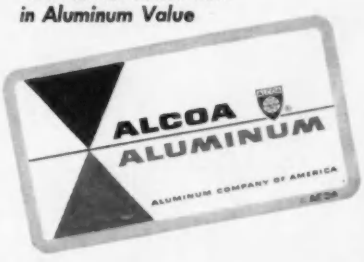
The beams were run through an exhaustive series of static tests. Then fatigue-tested at double-rated loads for *10 million cycles*. Then installed in actual trucks and tested in service (see below). The aluminum beams withstood the toughest tests, and thousands are now in service with no reported failures.

Every year automotive designers imagineer more and more new parts from Alcoa Aluminum. Our Development Division has unparalleled facilities to help *you* imagineer *your* 195X (or '6X!) models... in Alcoa Aluminum. Call us in.



Aluminum equalizer beams were installed in a test truck at Alcoa Development Division headquarters. The truck was given a 50% overload and then driven over 8″ square railroad ties. Oscillograph measurements recorded the heavy dynamic stresses on the beams. The beams withstood the toughest tests. ALUMINUM COMPANY OF AMERICA, 1841-D Alcoa Building, Pittsburgh 19, Pennsylvania.

Your Guide to the Best in Aluminum Value



THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

Always Fasten Aluminum with Alcoa Aluminum Fasteners

America's oldest shear builder

the most in accuracy, speed

NIAGARA

POWER SQUARING SHEARS

offers you

and thrifty performance

One of the greatest values of a Niagara Power Squaring Shear is the unequaled experience of its builder. Niagara has been making shears for more than 75 years . . . by far, the longest of anyone in the industry.

Today, as in the past, the oldest name in shears stands also for the most modern in shear design. Niagara has continually set the pace in offering the most of **things which count the most** in dependable shear performance.

why YOU GET THE MOST IN ACCURACY:

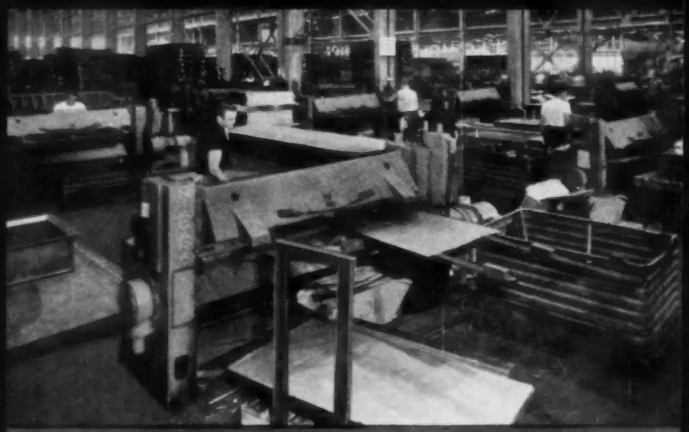
- With the cutting line fully visible, the positive power actuated, self-compensating holddown grips work securely. Multiple pressure feet on 6" centers apply uniform pressure, contacting the work with low impact to safeguard material and bed against damage. Long or short work is held tight against the bed. There's no rippling of the sheet as the keen edged, low-sloped upper knife shears through . . . clean and smooth.
- Niagara's fully closed box section construction of bed, crosshead, holddown and housings plus ample and accurately held crosshead guides resist horizontal, vertical and torsional stresses with minimum deflection.
- Edges are trimmed straight and true within micrometer tolerances. Blanks, too, are cut accurately to size and shape without making compensating allowances when setting gages. Only a Niagara Shear possesses **all** of the necessary features to insure maximum accuracy!

why YOU GET THE MOST IN SPEED:

- More working strokes delivered per minute and instant engagement of the Niagara Sleeve Clutch assure more cuts per hour. In continuous feed shearing, quick release of the power driven holddown enables a strip to be cut at each stroke.
- There's no need to adjust knife clearance every time a different thickness of stock is cut. Individual holddown feet are self-compensating. Two sheets of different thicknesses can be cut at the same time with the same knife adjustment and with the same accuracy.
- Ease of operation, quick setting gages and confidence inspired by safety features further increase hourly output . . . and make a Niagara Shear a truly productive, profitable investment for you!

why YOU GET THE MOST IN THRIFTY PERFORMANCE:

- Simplicity of design, involving a minimum number of parts, cuts out costly maintenance. With less to go wrong, there's less to repair and replace.
- Vital parts of Niagara's driving mechanism (clutch, gearing, flywheel, eccentrics and detent) operate in enclosed oil-tight cases. Ideal lubrication and maximum safety are thus insured.
- With power transmitted from the drive through efficient spur gears and Niagara's instant engaging, multiple-point sleeve clutch, there are no sliding surfaces (such as in worm gears and friction clutches) to consume power, generate heat and wear rapidly.
- Niagara 4-cutting-edge knives, manufactured entirely within the Niagara plant, are uniformly tough to withstand hard usage and are promptly available.



Niagara Shears at work in Ohio plant of one of the major electrical appliance manufacturers.

MOST EXACTLY SUITED TO YOUR NEEDS, TOO!

To fit your requirements exactly, consult a Niagara representative. With over 7 dozen models available in capacities from shim stock to 1" mild steel and in cutting lengths from 3 to 24 ft., he'll be able to recommend the shear that's **right** for you.

ILLUSTRATED, FACT-FILLED BULLETIN 69 MAILED FREE ON REQUEST

It will give you detailed information on the complete, modern line of Niagara Underdrive Squaring Shears. Write for your copy today.

NIAGARA MACHINE & TOOL WORKS, BUFFALO 11, N.Y.

DISTRICT OFFICES

BUFFALO • CLEVELAND • DETROIT • NEW YORK • PHILADELPHIA

Dealers in principal U. S. cities and major foreign countries

America's Most Complete Line of Presses, Shears, Press Brakes, Other Machines and Tools for Plate and Sheet Metal Work.

(*Continued from page* 122)

STUDEBAKER - PACKARD CORP., Detroit, Michigan
Trucks—11 ea.—$67,925
Concept study of turbine transmission—job—$25,138

SUNDSTRAND MACHINE TOOL CO., Sundstrand Aviation Div., Rockford, Illinois
Transmission, valve, gear boxes—$797,109

TEMCO AIRCRAFT CORP., Greenville, Texas
Maintenance and modification aircraft—$758,304

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.
Propeller assemblies—$200,000

WAUKESHA MOTOR COMPANY, Waukesha, Wisconsin
Auxiliary power plant—112 ea.—$168,514

WILLYS MOTORS, INC., Toledo, Ohio
Trucks—245 ea.—$483,621

THE YALE & TOWNE MANUFACTURING CO., Philadelphia, Pa.
Trucks, forklift—35 ea.—$227,647

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to Feb. 8, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the Mar. 15 issue, page 454 of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Office of Defense Mobilization, covering the period which extends from Feb. 9 to Mar. 7, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

DOUGLAS AIRCRAFT COMPANY, INC., Santa Monica, Calif.
Military aircraft—$489,812 (65)
Military aircraft—$817,844 (65)

FAIRCHILD ENGINE AND AIRPLANE CORP., Fairchild Aircraft Div., Hagerstown, Maryland
Military aircraft—$48,882 (65)

HARTFORD TOOL & DIE CO., INC., Bloomfield, Conn.
Aircraft engine parts—$63,105 (70)

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
Military aircraft—$444,243 (65)
Military aircraft—$491,578 (65)
Military aircraft—$264,258 (60)

RADIOPLANE COMPANY, El Paso, Texas
Research and development—$200,000 (60)

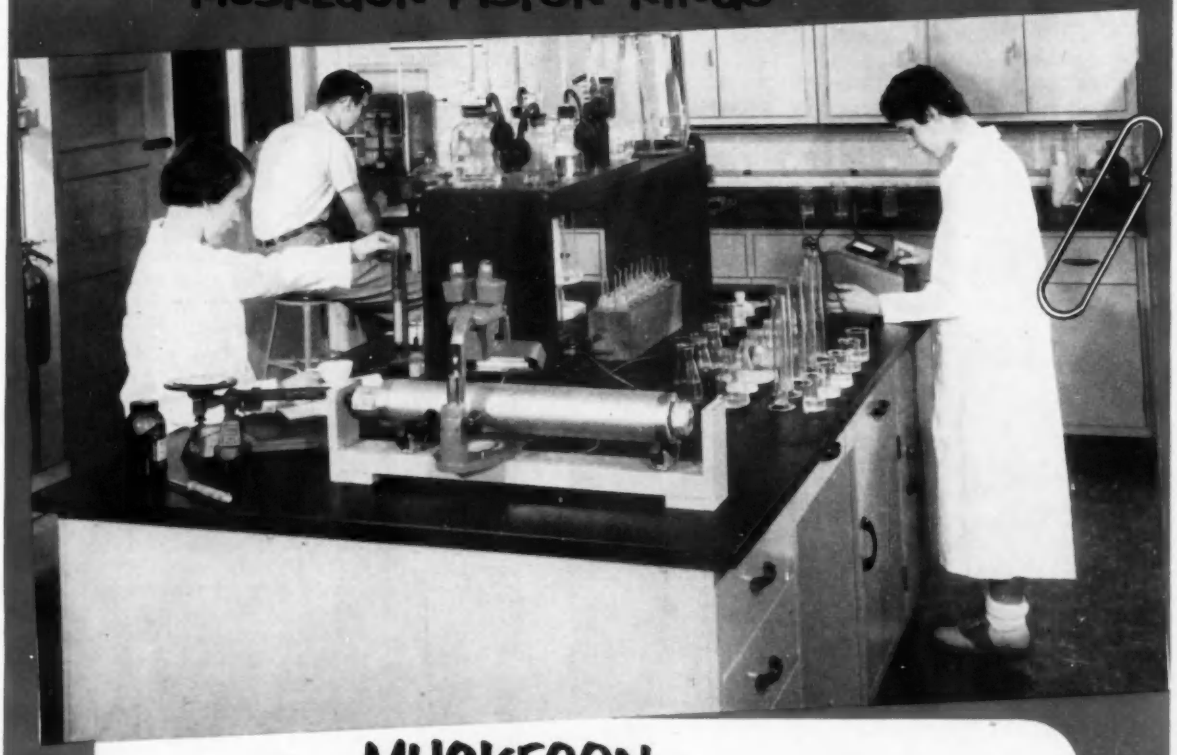
THE RYAN AERONAUTICAL CO., San Diego, Calif.
Military aircraft parts—$34,829 (65)

SOLAR AIRCRAFT COMPANY, Des Moines, Iowa
Aircraft engine parts—$64,298 (65)

WELCO, INC., Wellington, Kansas
Military aircraft parts—$35,545 (70)

YEAR AFTER YEAR... MODEL AFTER MODEL...

MORE THAN ONE OUT OF THREE CARS ARE EQUIPPED WITH MUSKEGON PISTON RINGS



BECAUSE MUSKEGON HAS WHAT IT TAKES FOR QUALITY, QUANTITY RING PLATING

Plating is an art at Muskegon! Skilled craftsmen carefully control plating baths to produce precision plating for longer life, greater ring efficiency. There is no sacrifice of quality for volume – yet quantity plating is done as a matter of course at Muskegon.

But plating is only one part of the Muskegon story. It starts with engineering design and development coordinated with the engine builders' engineering staff, and continues through the world's largest ring foundry, complete finishing production and inspection facilities. These have all helped put Muskegon rings in more than one of three cars produced, year after year. If your ring design demands special coating or plating, why not see Muskegon today?

No matter what the design of the individual rings needed to fill the grooves of your piston, rely on Muskegon as your source.

MUSKEGON Piston Rings

MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

DETROIT OFFICE:
521 New Center Building
Telephone: Trinity 2-2113

Since 1921... The engine builders' source!

East German Automotive Growth Reflected at Leipzig Fair

(*Continued from page* 55)

scoop are more finely spaced to increase heat dissipation in that region. Chassis greasing is by a one-shot lubrication system. The Wartburg is offered as a four-door hardtop, convertible, station wagon and pickup.

East Germany's smallest car, the plastic-bodied Zwickau P70, was exhibited as a two-door sedan and station wagon with tailgate. The 22-hp engine drives the front wheels. At Leipzig it was claimed that the 0.12 in. thick body skin was half the weight of suitable steel, and part of the display there was a test rig to demonstrate its resilience. This repeatedly deflected a fender molding by eight inches with no apparent ill effects.

An improved crawler tractor on show was the Urtrak KS 30, a 63-hp Diesel-powered vehicle which has articulated bogies supporting the track instead of the former rigid assembly. The four-cylinder engine develops its maximum power at 1150 rpm, and drives through a four-speed transmission with one reverse. Ground pressure is 6.5 psi.

Efforts to step up crawler production in East Germany were evidenced by the showing in the machine tool hall of an automatic transfer line designed for complete machining of track shoes at the rate of 55 units per hour. Seven stations with a total of 17 spindles drilled, bored, reamed, face milled and finish bored the link pin holes in the steel castings. The line was scheduled for delivery to the Brandenburg factory, where the Urtrak is made, when the fair closed.

East Germany's latest wheeled tractor is the RS 14/30 Favorit, with 30-hp Diesel engine and 12-ratio transmission giving a speed range of 0.7 to 14 mph. The front axle is centrally pivoted, with wheels suspended on the ends of the swinging beam, and with coil springs combined with the steering knuckles. Hydraulic implement control has three-point linkage. It is made at Nordhausen.

A very small industrial tractor, suitable for sidewalk snow clearance when fitted with a plow, was powered with a single-cylinder, four-stroke engine of six hp. Turning radius was said to be only 32 in.

One new Diesel engine displayed by East Germany was a big V-8 for stationary, marine or railcar application. Featuring an exhaust-driven turbocharger for supercharging, it develops 600 hp at 1500 rpm. Output with normal aspiration is 400 hp. Bore and stroke are 7.08 in. and 8.26 in., and compression ratio is 16 to 1. Dry weight is two tons.

The USSR exhibited two new wheeled tractors. The smaller, designated as model DT-14, has a single-cylinder Diesel engine rated at 14 hp at 1600 rpm. Bore and stroke are both 4.92 in., and piston displacement is 95 cu in. The engine, fitted with spark plug and carburetor, starts on gasoline. For this purpose, a spherical compression chamber is incorporated in the cylinder head which reduces the compression ratio from 15 to 1 to 6 to 1 when the sealing valve is opened. A rotating counterweight,

(*Turn to page* 130, *please*)

GET BEARING PERFORMANCE WITH BUSHING ECONOMY

For many applications our bimetal rolled split bushings give the needed bearing performance characteristics, but at lower bushing costs. Lining alloys to meet specific requirements. Controlled hardness. Large capacity. Complete engineering service. Address:

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SINCE 1899

RESEARCH · DESIGN · METALLURGY · PRECISION MANUFACTURING

chain-driven from the crankshaft, minimizes vibration.

Ground clearance can be varied by reversing the L-shaped steering knuckles in front and inverting the reduction gear housing at the rear. Track widths are also variable. The driver's seat can be repositioned ahead of the vertical steering column to face backwards. The horizontal steering wheel is then fitted to an auxiliary pinion shaft on the column so that the turning response remains normal. The transmission has five forward and four reverse speeds. Tractor weight is 3280 lb.

The Soviet DT-24 has a two-cylinder engine of similar construction which develops 24 hp at 1380 rpm. Six forward and two reverse speeds are available, and implement linkage has hydraulic control. Belt pulley and rear shaft pto are provided. Weighing 5900 lb, this machine was displayed in four-wheeled and row crop versions.

It was learned that the Russian tractor industry plans to bring out improved models of the DT-54 crawler and MTZ-2 wheeled tractor during the coming year. Following the governmental criticism of existing designs, it was said, these will be of lighter construction and more efficient than before. There will also be a four-wheel drive tractor.

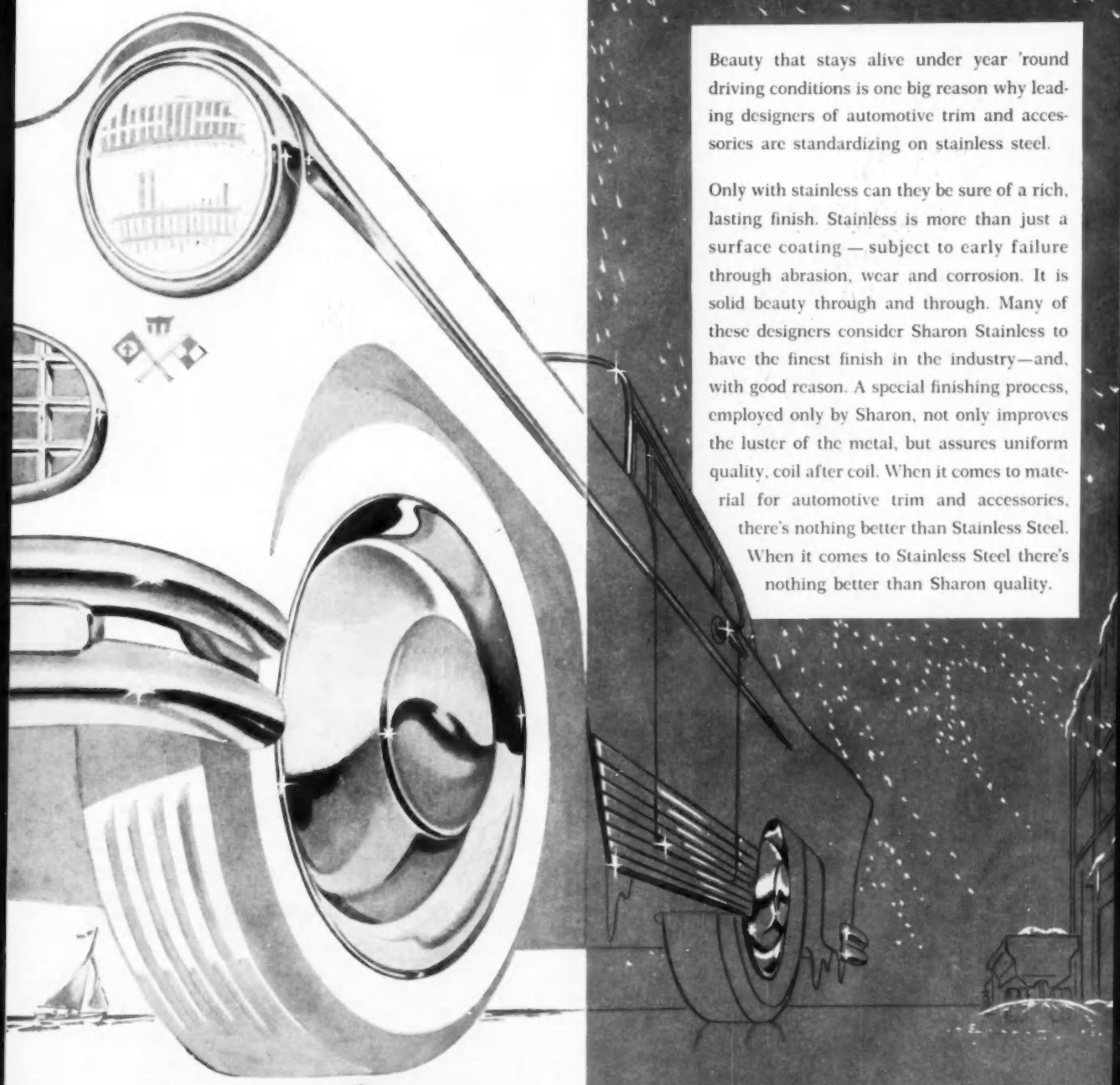
Rumania's exhibits gave further evidence of the widespread adoption of Soviet designs by the new engineering industries of the more backward members of the Communist bloc. That country's first crawlers, seen at Leipzig, were exact replicas of the KD-35 and bore the same designation. Similarly, its four-wheeled UTOS-2 was a copy of the MTZ-2. Both use the same four-cylinder Diesel engine, and have been in production for only a year or so.

The Rumanian trucks on show were basically similar to the Russian ZIS-150 and its derivatives. The SR-101 is a four-tonner with a six-cylinder, side-valve gasoline engine of 335 cu in. rated at 95 hp at 2800 rpm. A 26-passenger urban bus—the MTD—with the same power unit was also displayed. All these vehicles were stated to be for export.

Automotive exhibits from Communist China were this time confined to a trailer-mounted Diesel-generator. The engine was a four-cylinder unit developing 80 hp at 1000 rpm. The assortment of Chinese-built machine tools, once again all copies of Soviet types, included a crankshaft grinder, keyway miller and broach grinder.

(*Turn to page* 134, *please*)

SHARON STAINLESS ASSURES LASTING BEAUTY



Beauty that stays alive under year 'round driving conditions is one big reason why leading designers of automotive trim and accessories are standardizing on stainless steel.

Only with stainless can they be sure of a rich, lasting finish. Stainless is more than just a surface coating — subject to early failure through abrasion, wear and corrosion. It is solid beauty through and through. Many of these designers consider Sharon Stainless to have the finest finish in the industry—and, with good reason. A special finishing process, employed only by Sharon, not only improves the luster of the metal, but assures uniform quality, coil after coil. When it comes to material for automotive trim and accessories, there's nothing better than Stainless Steel. When it comes to Stainless Steel there's nothing better than Sharon quality.

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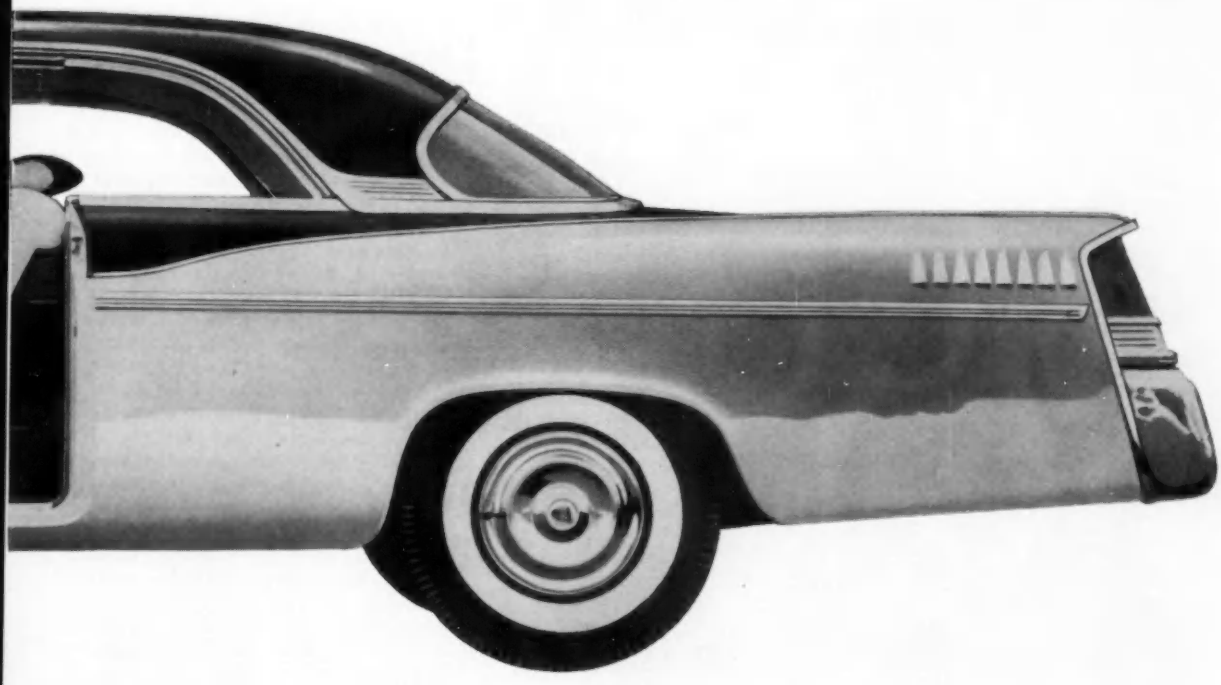
ALUMINUM EXTRUSIONS

ADD MORE BEAUTY TO

"THE FORWARD LOOK"



Chrysler Corp. engineers and stylists, always on the alert for new ways to improve design and reduce cost, recently changed seat moulding specifications on the Chrysler New Yorker and Imperial.

The new parts are beautiful, massive-appearing aluminum extrusions. Light Metals Co. of Grand Rapids is the supplier, using materials furnished by Kaiser Aluminum.

Aluminum extrusions were chosen over all other materials because of their beauty and economy.

BEAUTIFUL PARTS MADE POSSIBLE

Chrysler engineers found that the aluminum extrusion process made beautiful parts easy to produce. An extremely wide choice of graceful, decorative forms and shapes were made possible—and virtually any design created could be produced quickly and at lower cost than was possible with any other method.

Beautiful satin finishes were easily achieved by etching and anodizing . . . making aluminum's natural beauty extremely resistant to corrosion and abrasion.

TOOLING COSTS NEGLIGIBLE

Aluminum extrusions *drastically reduced tooling costs!* Simple tooling, limited to the die and standard bending jigs, also made it possible to quickly establish multiple sources of supply.

Versatile aluminum is helping to improve automotive design and reduce cost in many ways. Improvements and substantial savings are being made in screw machine parts and structural and functional components, as well as in trim and molding sections.

We are eager to work with you as an "idea partner." Let our automotive development engineers examine the parts now being used in your production so that we may recommend improvements and savings you can effect by specifying aluminum.

* * *

For immediate service, call TRinity 3-8000, Kaiser Aluminum & Chemical Sales, Inc., 1414 Fisher Bldg., Detroit, Michigan; *General Sales Office,* Palmolive Bldg., Chicago 11, Ill.; *Executive Office,* Kaiser Bldg., Oakland 12, Calif.

Kaiser Aluminum

Leipzig Fair

(*Continued from page* 130)

In the open area outside its hall China had a large crawler-mounted excavator.

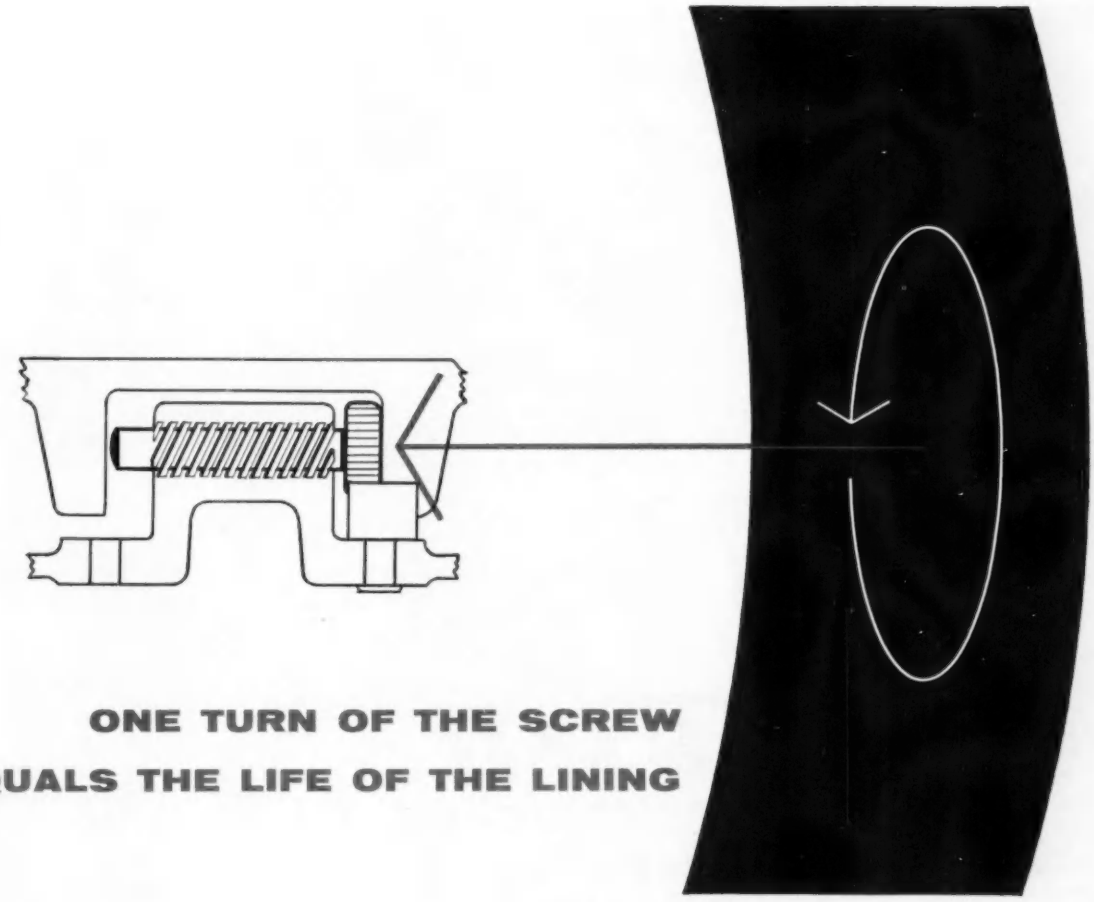
More west European manufacturers exhibited at Leipzig this year than in the past. British vehicle firms taking part were Standard, Rover, Leyland and Foden. Tractors were shown by Massey - Harris - Ferguson and David Brown, and Diesel engines by Rolls-Royce and Brush. A representative of the Society of Motor Manufacturers and Traders visited the fair to investigate the possibility of the British motor industry staging a collective display next year

Among the French companies aiming at Communist markets, Simca occupied an entire small building, while Renault and Berliet had space in the national pavilion of their country. No West German cars or trucks were exhibited, but tractor- and engine - builders participating included Unimog, Hanomag, Normag, Büssing, Modag, and MAN. Daimler-Benz had a separate stand for its Diesel engines and, it is understood, plans to show its vehicles in 1957. The Krupp combine, making its first post-war appearance at Leipzig, displayed Diesel engines together with examples of heavy industrial equipment.

BOOKS . . .

NATIONAL FIRE CODES, *published by National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass. Price, $6.00 per volume.* Published in six volumes, this is a compilation of 172 fire safety standards as developed by the NFPA. First issued in 1938, each volume of National Fire Codes has been periodically revised and expanded. There are a total of 43 changes in the 1955 volumes. Fields covered by the six volumes are: Vol. I—Flammable Liquids and Gases; Vol. II—Combustible Solids, Dusts, Chemicals and Explosives; Vol. III—Building Construction and Equipment; Vol. IV—Extinguishing Equipment; Vol. V—National Electrical Code and other electrical standards; Vol. VI—Transportation.

ATOMIC ENERGY — A REALISTIC APPRAISAL, *published by Atomic Industrial Forum, Inc., 260 Madison Ave., New York 16, N. Y. Price, $5.00.* This is the proceedings of a meeting held in late May, 1955, devoted to an evaluation and interpretation of the Forum's "Growth Survey of the Atomic Industry—1955-1965." The meeting presented industry and government estimates of the impact of an expanding atomic industry on private and government research and development activities, reactor component manufacture, fuel preparation and processing, and special problem areas.



ONE TURN OF THE SCREW EQUALS THE LIFE OF THE LINING

This most simple and practical self-adjusting screw is exclusive on the Auto Specialties aluminum Double-Disc Brake.

There are 50 notches on the head of this self-adjusting screw. And, unlike the old badmen of the West who used to notch their gun handles every time they took a life, we figure that every time this screw turns a notch, it can save a life. Because, as brake lining wears two or three thousandths of an inch, the screw turns one notch and advances the lining toward the braking surface—compensating even for this small amount of wear and keeping the brakes in adjustment and proper alignment all the time. This makes braking with Auto Specialties Double-Disc Brakes safer all the time.

This amazing screw keeps the clearance between the lining and the braking surface constant. Thus, with Auto Specialties Double-Disc Brakes, pedal height is always the same. This assures ample pedal for braking under all conditions.

During a recent series of the most gruelling tests any brakes were ever subjected to, this screw *automatically* kept Auto Specialties Double-Disc Brakes in accurate adjustment. And the screw was still operating efficiently after thousands of rugged stops from low to very high speeds. This performance under most strenuous conditions far surpassing the braking any car would receive during normal life, proves that Auto Specialties Double-Disc Brakes do automatically stay in adjustment. For any disc brake to operate efficiently, an automatic adjuster that works effectively under all conditions is an absolute necessity.

Auto Specialties engineers have proven that Auto Specialties rugged, long-life Double-Disc Brakes (1) automatically stay in adjustment, (2) do not fade, and (3) are competitively priced—ready for adoption.

For more information write to Auto Specialties Mfg. Co., Inc., Saint Joseph, Michigan.

AUTO SPECIALTIES MFG. CO., INC.

SAINT JOSEPH, MICHIGAN

Plants also at Benton Harbor and Hartford, Mich., and Windsor, Ont., Canada.

Manufacturing for the automotive and farm machinery industry since 1908.

SHELL MOLDING Among Chief Subjects

SAE ANNUAL PRODUCTION FORUM

(*Continued from page 73*)

(2) Better tool life due to the absence of burned in sand.

(3) Cleaner side surfaces on cam lobes, with no ragged edges.

Perhaps the most important and interesting application for shell molding is the Pontiac crankshaft. Production quantities of shell cast Armasteel crankshafts have been produced for Pontiac for several months. Since March 1st, we have been supplying 100 per cent of their requirements, completely replacing old steel forgings.

Without shell molding, the successful development of the pearlitic malleable iron crankshaft would have been exceedingly difficult, if not impossible. Early experience with experimental sand castings was discouraging from the standpoint of metal soundness. It seemed that no matter how many feeders were used or where they were placed, we could not make porosity-free castings. For reasons still not entirely known, we are able to make consistently sound castings by the shell process with only two feeders.

The small craft angles required by the shell process, along with the inherent ability to draw deep pockets, permits wide latitudes of crankshaft design never before possible. Many of the previous restrictions encountered by engineers in the shape and location of counterweights can be overcome. Therefore, it is possible to cast a shaft for a V-6 engine, which is difficult to forge, or an eight-counterweight shaft for a V-8 engine, which cannot be forged on a practical basis because of die problems. In these cases the closeness and extreme flare of the counterweights will not provide for adequate strength in the forging die.

The good long-run dimensional control provided with shell castings has permitted a substantial reduction in the amount of machining stock allowed.

Accuracy with Shell Molding

By R. B. Melmoth

Supervisor, Test Metals Section
Manufacturing Research Department
Ford Motor Co.

There are certain limitations on the accuracy of shell molding which are significant in the choice of a casting method to meet a given set of dimensional specifications. The use of automated machining makes consistency of dimensions much more important than minimized machined stock; if we reduce machine stock to 0.030 in., we cannot operate from locators which vary by this amount. Whether we assemble our shells by clips, bolts, cement, or merely apply weight, there are three prime sources of dimensional inaccuracies:

1. The presence of a parting line.
2. The fact that shell molds, in spite of being bonded with a thermosetting material, do soften under heat.
3. The length of time that a ferrostatic head is imposed on the mold.

To produce an accurate casting, we must hold the shell halves together and provide adequate external support to prevent swelling. Swelling is at a minimum in the casting of metals

(*Turn to page 140, please*)

Electrical Discharge Machining

saved $448 sinking this forging die using BRASS electrodes

Conventional Method

Mill Cavity (Man and Machine)	56 hours
Hand Finish (Experienced die sinker)	52 hours
TOTAL	108 hours

ELOX method

Forge Electrode (Man and machine)	2 hours
Set up and change electrodes (man and machine)	8 hours
Machine hours only (no operator required)	32 hours
Hand finish after E.D.M.	2 hours
TOTAL	44 hours

Saved: 64 hours at $7 per hour

additional EDM advantages in forge die machining:

- Dies are fully heat treated prior to machining thus eliminating possible distortion.
- Resizing forging dies after washout can be done within two hours.
- Inherent workhardening values are retained in the dies since no additional re-heat treating is necessary.
- Actual die life is increased.
- Many forge die alloys are self-polishing after EDM.

This machining application is one of many time and material saving jobs being turned out by the standard Elox M-500 Electronic Machine Tool. See EDM in operation at Elox Demonstration Centers.

*T.M. Reg.

elox

corporation of michigan

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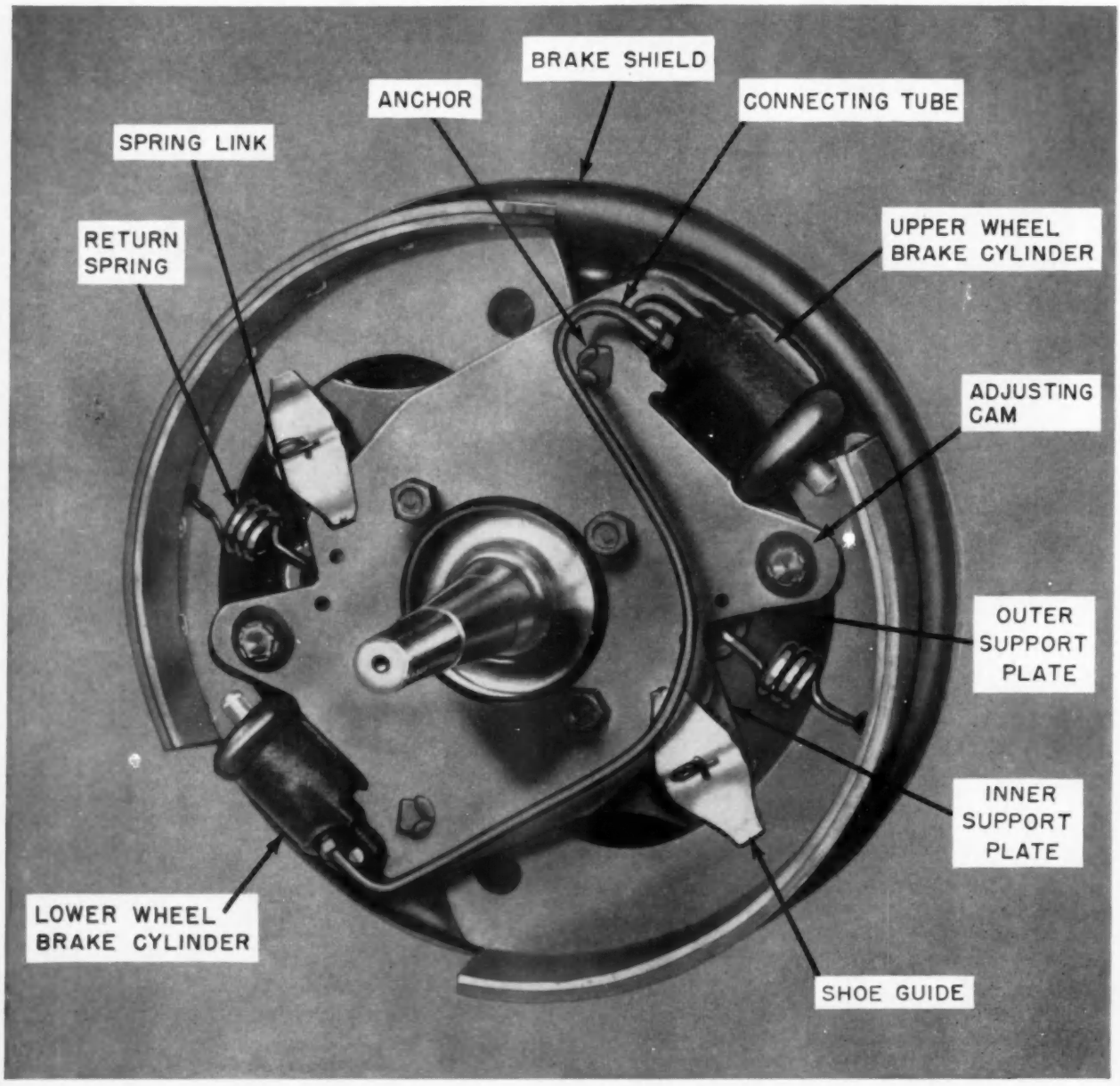
Elox Electron Drills for removing broken taps, drills, etc., from $495 to $3450.

Bundyweld Tubing specified



WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

← **NOTE** the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

by Chrysler for advanced, new center-plane brakes

Dependable double-walled steel tubing is used in 95% of today's cars, in an average of 20 applications each

Chrysler's famous *FORWARD LOOK* is more than skin-deep. One of the unseen advances is in its new center-plane brakes, where mechanical linkage has been replaced by an ultra-dependable internal hydraulic system. From brake pedal to brake shoe, the Chrysler's "stopping" power now relies on Bundy Tubing.

Fuel, lubrication, brake, or control lines—you just can't beat Bundyweld for strength and dependability. Used on all major automobiles, it is the tubing standard of the industry.

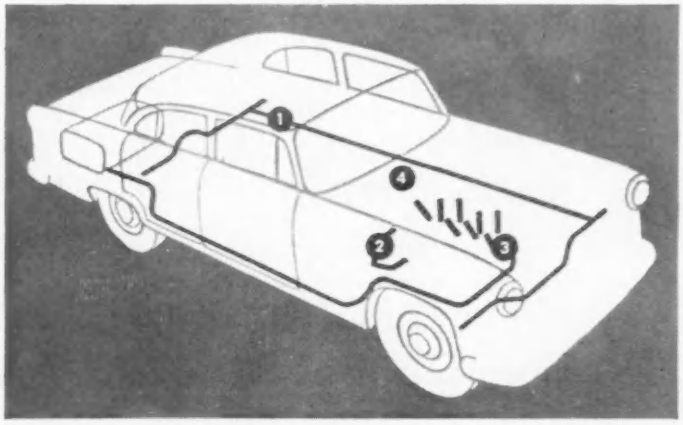
Bundyweld is leakproof by test; thinner walled yet stronger; has high bursting strength; takes easily to standard protective coatings; has high fatigue limits. It's the only tubing double-walled from a single metal strip; copper-brazed throughout 360° of double-walled contact.

In addition, Bundy offers you unexcelled fabrication facilities, expert engineering services; custom packaging of orders; prompt, *on-schedule* deliveries. Whether you fabricate your own parts or want us to do the job, we're equipped to handle your order—exactly to your specifications.

Call, write, or wire today for complete information or for specific help with your problem.

BUNDY TUBING COMPANY • DETROIT 14, MICH.

BUNDYWELD STEEL TUBING—"LIFELINES" OF YOUR CAR



1

Bundyweld lifelines in your car's hydraulic brake system are *many times stronger than necessary to save your life.*

2

Leakproof Bundyweld helps keep oil where it belongs in your car—with no delays, costly repairs, ruined engine.

3

Fuel lines of Bundyweld won't fail you, despite constant beating from flying rocks, punishing vibration.

4

To help keep push-button windows foolproof, manufacturers depend on Bundyweld to conduct the hydraulic fluid.

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DOUBLE-WALLED FROM A SINGLE STRIP

Bundy Tubing Distributors and Representatives: *Cambridge 42, Mass.:* Austin-Hastings Co., Inc., 226 Binney St. • *Chattanooga 2, Tenn.:* Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • *Chicago 32, Ill.:* Lapham-Hickey Co., 3333 W. 47th Place • *Elizabeth, New Jersey:* A. B. Murray Co., Inc., Post Office Box 476 • *Los Angeles 58, Calif.:* Tubesales, 5400 Alcoa Ave. • *Philadelphia 3, Penn.:* Rutan & Co., 1717 Sansom St. • *San Francisco 10, Calif.:* Pacific Metals Co., Ltd., 3100 19th St. • *Seattle 4, Wash.:* Eagle Metals Co., 4755 First Ave., South *Toronto 5, Ontario, Canada:* Alloy Metal Sales, Ltd., 181 Fleet St., [illegible] • **Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.**

(*Continued from page* 136)

with a short freezing range. Materials subject to supercooling, and the hypereutectic alloys, exaggerate the condition.

A few typical sets of figures have been compiled based upon a survey of gray and nodular iron castings of various sizes cast in shells assembled by different methods:

1. A small stack-molded rocker arm casting—cast 10 high and weighted, showed an average increase in its 1¼ in. thickness of 0.015 in. ranging from 0.006 in. at the top of the stack to 0.026 in. at the bottom. It can be demonstrated, incidentally, that the sealing force at the bottom of a stack of castings is less than that at the top, as a result of the accumulated buoyancy.

2. A chunky 12-lb casting made in glued shells and shot-backed averaged 0.013 in. in four in. with a low of 0.003 in. and a high of 0.013 in.

3. A seven-pound casting in spring-clip shells, shot-backed, averaged 0.013 in. in four in. with a low of 0.006 in. and a high of 0.023 in.

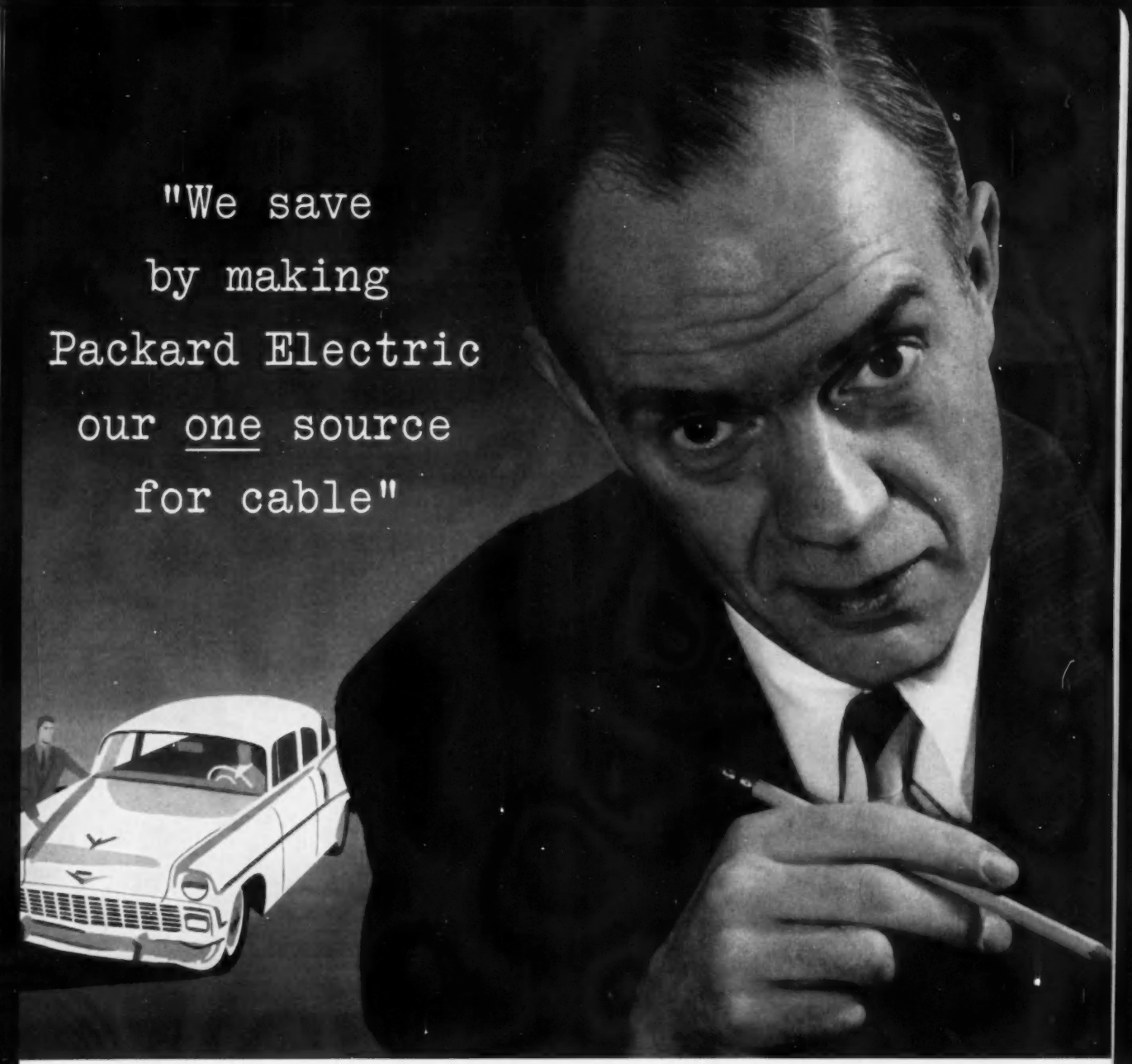
4. An eight inch diam gear blank cast in glued shells, shot-backed, varied 0.015 in. in rim thickness of 1¼ in. with a low of 0.007 n. and a high of 0.023 in. (Bolting or cementing between the spokes cuts this dimensional increase in two.)

5. Camshafts, two feet long, cast horizontally in clip-shells, shot-backed, varied an average of 0.011 in. on their two in. bearing diameters with a low of 0.003 in. and a high of 0.027 in.

The reference under "4" above, to additional cementing or bolting at intermediate points suggests that another factor to watch carefully is the unsupported span at any given cross-section. If shells are to be shot-backed with the parting line horizontal, it is unlikely that a sufficient depth of shot can be applied to offset the head of metal in the pouring cup without spilling shot into the pouring cup. The unbalanced lift during pouring becomes a shell separating force; the degree of separation is logically a function of the length of the unglued or unbolted span.

Less trouble is experienced if the parting line has deep offsets creating a box section. This is borne out by the V-8 crankshaft which has two journals lying outside the major parting plane. The box section formed by this break in the parting plane is responsible for holding out-of-round to about 0.010 in. in these two bearings compared to 0.030 in. to 0.050 in.

(*Turn to page* 144, *please*)



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THE ABILITY OF PACKARD ELECTRIC to produce large quantities of uniform-quality cable, *at the right price*, makes Packard Cable first in sales to manufacturers of automotive equipment.

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Spicer introduces the 1480 Series Universal Joints for the new Heavy Duty Medium Trucks

With new, more powerful engines, Medium Trucks have entered the Heavy Truck field. For these new Heavy Duty Models Spicer has developed a new Heavy Duty Medium Truck propeller shaft with Universal Joints designed expressly for this requirement.

The Spicer 1480 Series is designed for use in the larger 3 to 4 ton trucks, buses and other automotive vehicles in the 20,000 to 28,000 pounds gross vehicle weight class.

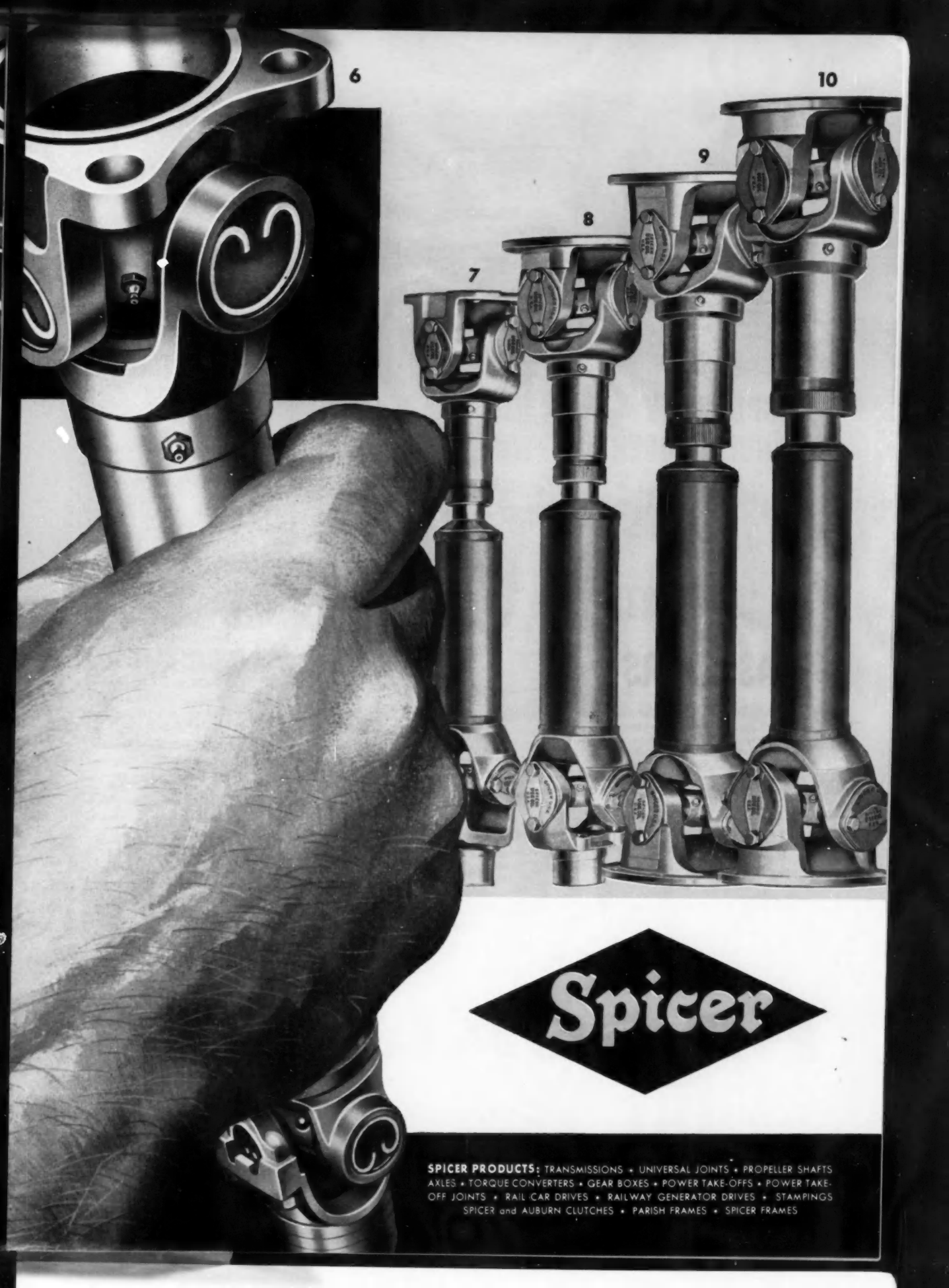
The 1480 Series is manufactured on the same high production machinery that produces millions of Spicer joints and propeller shafts for light and medium trucks.

To accommodate the wide variety of models demanded by truck users today involves many difficult drive line problems. DANA engineers will be glad to work with you on the application of the 1480 Series in your chassis.

1. 1000 Series and 1100 Series—Power Take Off Joints.
2. 1260 Series—Passenger Car and ½ Ton Pick Up Truck applications. This includes vehicles up to approximately 5000 pounds gross vehicle weight.
3. 1310 Series—Large Passenger Car and ¾ and 1 Ton Truck applications. Approximately 7500 to 10,000 pounds gross vehicle weight.
4. 1350 Series—for 1½ Ton Truck application. Gross vehicle weight approximately 10 to 15,000 pounds.
5. 1410 Series—for 2 and 2½ Ton Truck applications, in range of 16,000 to 20,000 pounds gross vehicle weight.
6. 1480 Series—3 to 4 Ton Truck applications. In range of 20,000 to 28,000 pounds gross vehicle weight.

7-8-9-10. 1500-1600-1700 and 1800 Series for Heavy Duty and Off-Highway Trucks—30,000 pounds gross and up vehicle weight.

DANA CORPORATION
TOLEDO 1, OHIO



Spicer

SPICER PRODUCTS: TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS
AXLES • TORQUE CONVERTERS • GEAR BOXES • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • STAMPINGS
SPICER and AUBURN CLUTCHES • PARISH FRAMES • SPICER FRAMES

(*Continued from page* 140)

in those lying in the major plane. This suggests an effective tool to control parting line variations — the use of blown shells with ribbed outer surfaces. External sand ribs across internal cavities sharply reduce swelling tendencies.

The ultimate in dimensional control in any shell mold casting can be obtained by casting in a permanent backup, contoured with the blown shell; in effect, refractory-lined permanent mold. This would involve high capital expenditure, but could pay big returns in volume production by reducing machine stock to an absolute minimum, and more important, producing a dimensionally-consistent casting which permits accurate fixturing in subsequent operations.

• Forging •

Consumable electrode melting for some of the rare alloys was widely discussed at the forging meeting. In general, it was felt that this method provides a much greater uniformity of metal. On the subject of molybdenum, the panel felt that there is a need for better equipment to get the full benefit from the alloy. It was brought out that extrusions are being made using glass as a lubricant by means of the French process. A furnace has been developed to heat molybdenum ingots to 3000 F for proper forging and extrusion. Oxidation is being held down by means of a ceramic bonding material. There was much discussion concerning the fabricating of titanium shapes by rolling and extrusion. The feeling was that rolling is the more economical of the two.

• Free-Machining Steels •

Panel members stated that the leaded steels have about one-half the coefficient of friction of regular steels. The optimum cutting speed of the leaded type is in the range of 300 to 400 fpm. The use of sulphur tends to reduce the coefficient of friction of stainless steels for easier machining. One panel member stated that hydrogen treated steels are being machined at the same rate as leaded steels. It was agreed that a new table of feeds and speeds is needed for the free-machining steels, as the present tables are inadequate.

• Capital Spending •

A most significant fact stemming from the capital spending session was that there will be a 50 per cent increase in production in the next 10 years with only a 14 per cent increase in the work force.

How stop-and-go driving creates need for *low-duty* lube oil detergency

As you know, low-duty engine operation accounts for a large percentage of the average car owner's driving.

For 48% of American passenger car trips, for example, the average is less than 4 miles. For 75%, it is less than 10 miles. And more than 90% of all city bus, taxi and delivery truck operation is in stop-and-go city traffic.

Excessive build-ups of engine sludge are likely to result from these low-power, low-temperature operating conditions.

New-type detergents

After extensive research on this problem, Du Pont has developed two entirely new-type synthetic detergents . . . Lube Oil Additives 564 and 565.

Both are ashless *polymeric* additives that provide an economical and effective means of preventing engine oil sludge—particularly under low-duty, stop-and-go driving conditions.

V. I. improvers, too

Both of these additives do double duty as detergents and as V. I. improvers. The chief difference between these two polymeric additives is their molecular weight . . . providing refiners a choice, depending on the amount of V. I. improvement and shear stability that are required.

More efficient operation

These additives keep the engine oil system operating more efficiently. Oil screens, rings, pistons, filters and other engine parts are kept clean and free from sludge. The resulting free flow of oil throughout the engine keeps it in better condition for longer periods.

For more detailed information on how these new-type additives can improve automotive performance, call any of our sales offices listed below for a copy of "Du Pont Lube Oil Additives."

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ASTE's Largest Tool Show

(*Continued from page 53*)

Assemblies have ranged from a switch requiring only three rivets, to a unit which involves five components fastened by 12 rivets.

Carter Controls, Inc., showed its new remote control valve operator, a rotary actuator that transforms reciprocating cylinder action into rotary motion. It is designed for 90-deg rotation as standard, but can be furnished to deliver 360-deg rotation or any portion thereof. With the actuator it is possible to stop action and hold at various points in the rotation cycle. It may be powered with air or hydraulics.

Index Machine Co. exhibited its new Model 45 vertical milling machine featuring rigidity, added range, and versatility in a sliding overarm turret type mill. Also shown by this exhibitor was the improved Super Model 55 vertical miller with 50 per cent more capacity than previously available.

Two new carbides, one formulated for milling high strength cast irons and the other a high titanium type with nickel binder for precision cutting of steels, were revealed at the show by Carboloy Department of General Electric Co. The carbide for milling, called grade 860, will reportedly last 20 to 30 per cent longer in machining high strength cast irons such as used in the automotive industries. Because of its structure and added toughness, the high titanium carbide, designated 330, is said to be less susceptible to chipping or cracking while in use.

Warren Plastics & Engineering, Inc., announced the availability of plastic dies for bending metal tubing. Complex forming in multiple planes, including short radius bends, are said to be possible with this new process. The plastic dies may be used with conventional stamping or forming presses for either high or low production runs.

Wesson Co. entered the machine field for the first time with the announcement at the show of a new offhand single point carbide tool grinder. Called the "Poweramic," the grinder is designed to eliminate lateral tool movement ordinarily performed by the operator and to produce micro finishes on all standard and special single point tools.

A new device for hopper feeding of standard socket setscrews was exhibited by The Bristol Co. The feeder automatically feeds and positions setscrews to automatic power screwdrivers. Feed rates up to 2700 per hour are said to be obtainable, limited only by the rate at which the screwdriver can be operated.

Allegheny Ludlum Steel Corp., for the first time, showed sample etched disks made by consutrode remelting, a process designed for the production of high purity metals. During the process the ingot is made by conventional means, and this ingot becomes the electrode for remelting in the consumable electrode furnace under vacuum. The resulting metal, introduced as a superior tool steel, is said to be suitable for high temperature bearings in jet aircraft, for rolls requiring a high finish and polish, and for other applications requiring maximum homogeneity and cleanliness.

The Ross Operating Valve Co. exhibit, which included a variety of new air control valves recently added to the company's lines, also showed the new all-air circuit for presses, brakes, shears and other machines. The cir-

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cuit features a non-tie-down special purpose valve, single stroke valve, and three-way poppet palm button valves for promoting increased operator safety.

Unusual exhibits at the exposition were: Armour Research Foundation, with the ASTE, sponsored a combination exhibit consisting of a display of industrial diamonds, a model of a diamond mine, and an operating diamond workshop. Armour Research Foundation, in a separate booth, exhibited a model of a nuclear reactor, for industrial research, which is now being constructed in Chicago. U. S. Army Ordnance had an inspection equipment display which included an M-48 Tank and its 810-hp powerplant; and the new 106 mm recoilless rifle mounted on a jeep.

Technical Sessions

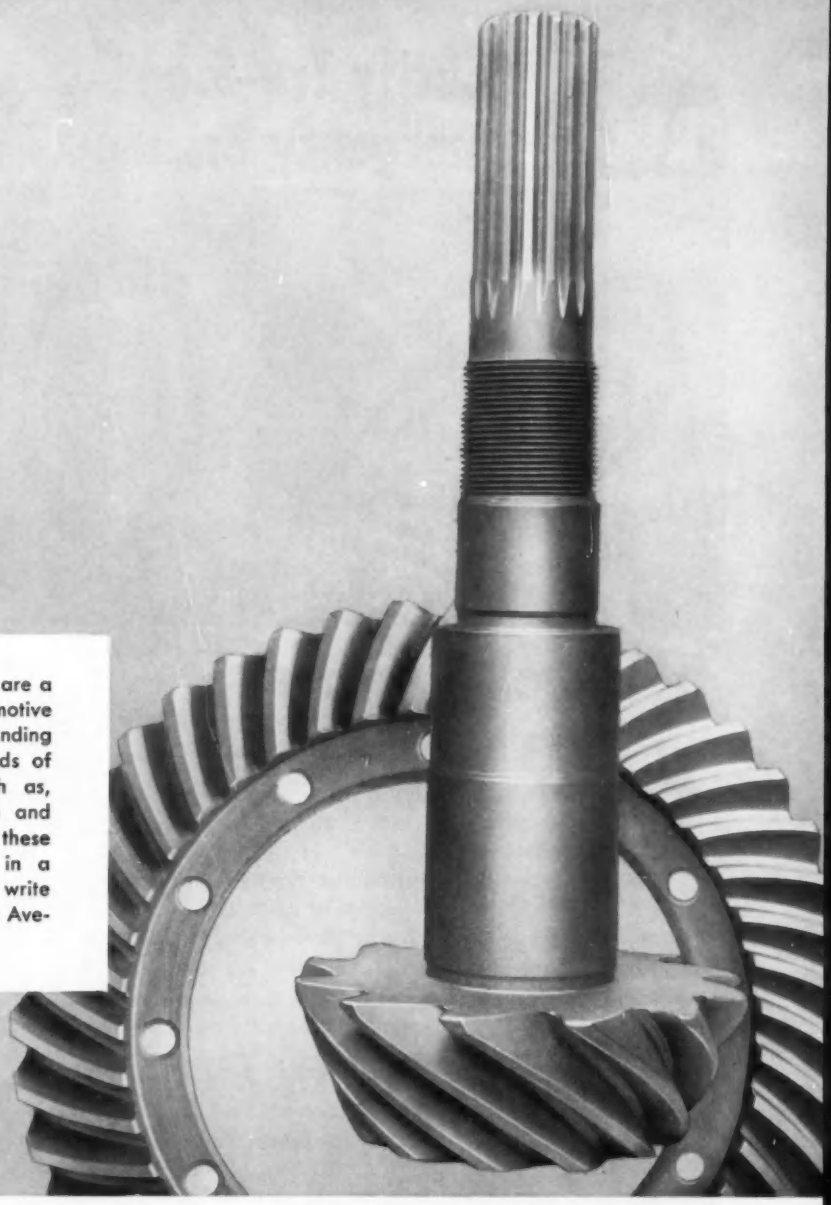
Automation was the underlying theme of many of the industrial conferences. To illustrate the application of sectionized automation, Ralph E. Cross of Cross Co. discussed a Transfer-matic for V-8 cylinder blocks which rough bores the cam bearings and performs all of the drilling, reaming and tapping operations; 550 operations in all. The machine is divided into five sections, he stated, so that operations in one section can be shut down without interrupting operations in the other sections.

Application of numerical control to the precision jig borer opens a vast new area of usage for this machine. The combined unit, according to J. J. Jaeger, Pratt & Whitney Co., makes possible economic production of short runs of precision parts without the need of elaborate setups and tooling. Furthermore, the control system has the advantage of making new applications possible without introducing the hazards of an entirely new machine.

On the other hand, J. Daugherty, Giddings & Lewis Machine Tool Co., warned against the application of numerical control to today's machines because such applications would handicap a control process capable of extreme accuracy with machines that are not top standard. To realize the full potential of the new control systems, he pointed out, machines will have to be designed that incorporate the complete control within the feedback loop; are as free as possible from geometrical errors; reduce bearing wear to a minimum; and correct for distortions due to temperature variations in the machine and workpiece.

J. J. Stone, Jr., Battelle Memorial Institute, in discussing the basic oper-

"IT'S BETTER IF IT CONTAINS MOLY"



Moly carburizing steels with 0.5% Mo are a natural for components like this automotive ring-gear and pinion. They have outstanding properties that suit them to the demands of gearing and similar applications, such as, superior case hardness, low distortion and good machinability. Many features of these new carburizing steels are discussed in a recent technical article. For a reprint, write Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y., Dept. 4.

Molybdenum Carburizing Steels

MOLYBDENUM OFFERS THE ECONOMICAL KEY TO PERFORMANCE

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Design engineers know moly steels for their uniform hardenability, toughness and wear resistance.

Production men know that moly steels are easy to heat treat, easy to machine.

Management knows that moly steels mean economy in fabrication, high performance in a wide range of end products.

Standard molybdenum carburizing steels are widely available. Higher moly analyses may be ordered in heat lots from a number of leading suppliers.

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- High case hardness
- Wide choice of hardenability
- Easy to heat treat
- Low distortion
- Good machinability
- Good wear resistance

ating principles of computers, pointed out that every application need not involve elaborate computing systems or the control of large machines. The existence of the rather small, analog-type, machinability calculator is an example, he said, of what can be accomplished with a small, low-cost device to assist machine tool operations.

The present method of spot checking and quality control in the production of gears is uneconomical because it usually finds scrap only after much of it has been produced. The most economical method, according to T. S. Gates, National Broach and Machine Co., is to check every gear as it comes from the machine and to reset the machine to correct the error immediately. There are automatic gages in the design stage now, he reported, that will automatically check and chart a series of individual checks on gear tooth dimensions.

An electrical analog computer can solve many production problems by making it possible to apply such information as metal-cutting data, which up to now was either not correlated or was too cumbersome for use. Such an analog computer, according to Dr. W. W. Gilbert and E. J. Weller, of the General Electric Co., can be designed to: solve the basic machinability equations for both tool life and power data; give a reasonably accurate answer when as many as 19 variables are introduced; give good accuracy when only two variables are used; incorporate numerical dials so that new materials, tools, and cutting conditions could be catalogued; set up a basic concept of cutting so that results from one operation, such as turning, could be applied to other operations, such as boring or drilling.

At the shaped diamond tool symposium, the speakers discussed the economics, future, methods of selection and manufacture of diamond tools. I. A. Hurwitz and R. A. Kurtz, both of Hamilton Watch Co., stated that even though the initial cost of diamond tools is higher than that of high-speed steel or sintered carbide tools, wear resistance of the diamond tool cutting edge surpasses the wear resistance of high-speed tools by a factor of 20 or 30 to 1, and surpasses carbide tools by a factor of 3 to 1. M. Hoerer, Golconda Corp., stated that standardization of diamond tool shanks will facilitate interchangeability of tools from one machine to another; save many man hours in the specification and purchasing of diamond tools; and save time and materials in the resetting services offered by diamond tool manufacturers. R. G.

BCA

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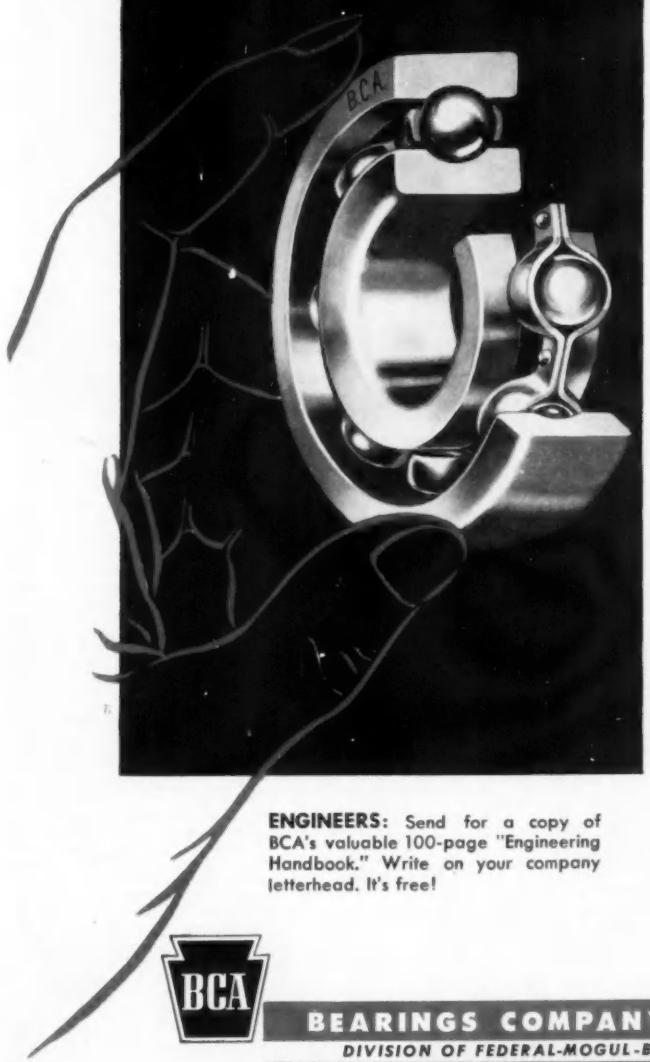

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DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC.

LANCASTER • PENNSYLVANIA

Weavind, Industrial Distributors, Ltd., described methods of manufacturing shaped diamond tools to high precision limits which do not require the use of highly skilled personnel. Admittedly, some knowledge of the diamond crystal structure is required before it is possible to make a tool from any diamond, he said; bue it is possible to train intelligent personnel in as little as six weeks how to choose, divide, set, and polish a stone satisfactorily.

Extra Capacity Diamond T Tractor

(*Continued from page* 104)

Many fleet operators, however, prefer to standardize on the single-speed rear axle, and this is now a practical unit even for the Diesel tractor when a sufficient number and range of transmission reductions are available.

In Model 723CJT, there is an option of several single-speed rear axles with the Fuller eight-speed R46 transmission, which provides performance comparable to the two-speed and five-speed transmission and requires less skill to handle.

Single-speed rear axle options include the Eaton 1893 which is the single-speed equivalent of the standard 18803; also the Eaton 1911 which is identical in design but with heavier housing, gears and shafts; and also the Timken hypoid R100 which is favored for extra-heavy-duty service.

Fuel tanks are available in a range of several sizes and types, including Snyder saddle-tanks in 106 gallon and 125 gallon sizes, side-mounted step-tanks, and special light-weight cylindrical aluminum tanks of 100 gallons total capacity.

Widest use of Model 723CJT will naturally be as a conventional tractor, but six-wheel variations are available with a choice of Eaton-Hendrickson and Timken tandem-drive rear axles for both highway and off-highway service. Six-wheel models carry a rating of 41,000 lb GVW in preferred service.

BOOKS . . .

PLASTICS PROGRESS 1955, *published by Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. Price, $17.50.* The third volume to appear under the title of "Plastics Progress," this 426-page book is a report of the convention which formed part of the British Plastics Exhibition and Convention held in June, 1955. The papers given at this convention, as well as the discussions, are presented in full. Contents are grouped under the general headings of polymer structure and properties, expanded plastics, thermoplastics, extrusion, work study and productivity, injection molding, patents, foundry resins, and glass reinforced plastics.

MODERN PETROL ENGINES, *by Arthur W. Judge, published by Chapman & Hall, Ltd., 37 Essex St., London W.C.2, England. Price, 56s.* The second edition of this book has been revised to include the latest developments in gasoline engine research and application. New chapters have been added dealing with detonation research, combustion chamber design, and alternative fuels, particularly the various fuels for high-output and racing engines. Selected examples of improved engine designs are discussed in order to give the reader an indication of current design trends and progress. The author has also included formulas and a correction chart for converting the results of bench horsepower tests to standard atmospheric pressure, temperature, and humidity conditions. Because it covers both the basic theoretical principles and the important applications of automobile, aircraft, marine, and stationary high-speed gasoline engines, this book will be useful to the designer, engineer and draftsman as well as to the student.

See the new Saw from C-B Tool Company

IT WEIGHS LESS, COSTS LESS, WORKS BETTER

The C-B Tool Co. Story

It was easy! Engineers from C-B Tool Company, Lancaster, Pa. and OSTUCO in Shelby worked out a welded steel tubing component to replace a heavy, bulky oil reservoir and to serve as a handle for the new saw. See the difference this makes in the new Lancaster Model 400A chain saw:

- **Saves Cost—$4.25 on each chain saw!**
- **Saves Weight—3 pounds on each unit!**
- **Works better—Saw now has positive, continuous oiling instead of push-button oiling by the operator.**

Perhaps this story from C-B Tool has a message for you.

If you have trouble with see-sawing production costs and quality, OSTUCO may have the answer to your problems. Unique single-source service eliminates interplant shipment, reduces error, gives better production control. See about it . . . see OSTUCO! Contact the Shelby office or your nearby OSTUCO Sales Engineer for details.

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Electroless Nickel Plating

(*Continued from page* 67)

can be obtained with electroless nickel plating often eliminate the need for most "over plate and grind to tolerance" operations which are often required for precision parts. Electroless nickel-plated parts, such as springs, show considerably less hydrogen embrittlement than parts coated with conventional electroplates.

Applications

Complex items such as valves, regulators and bearings which could not be uniformly plated because of the inadequate throwing power of the electrolytic process respond to the new method. Internal areas of pipes, cylinders or tubes whose inner and outer surfaces could not be simultaneously finished with electroplating equipment are other applications. Electroless nickel deposits have been successfully applied to solenoid interiors and to hermetically sealed units. Sealing of plateable aluminum alloy units is readily accomplished by soft soldering after being coated with electroless nickel.

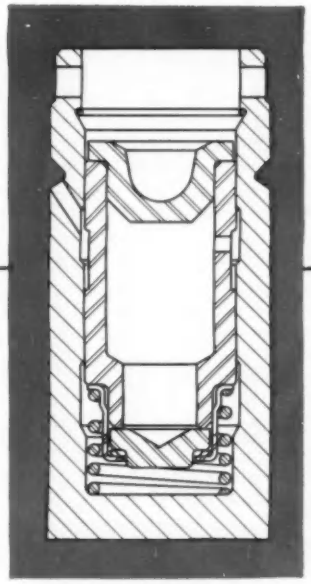
In certain corrosive environments low alloy steel parts coated with electroless nickel can be used in lieu of more expensive corrosion resistant steel parts.

The reduction of weight, which is of special concern to aircraft designers, can often be accomplished by specifying electroless nickel-plated aluminum parts in lieu of those made from heavier metals. Such applications would be restricted to those applications in which surface condition determines material choice.

Electronic items such as wave guides, contacts, and printed circuits can be successfully coated with electroless nickel deposits, in addition to providing solderability of an electroless nickel-plated aluminum alloy transducer housing.

A 0.0006 in. thick electroless nickel coat will prevent nitriding; such deposits may be used as a means of masking parts where selective nitriding is desired.

Electroless nickel deposits have been advantageously specified for electrical parts where humidity causes damage. For example, miniature electric motors with electroless nickel-plated rotors have been capable of operating after prolonged humidity



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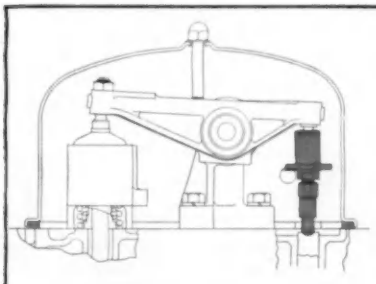
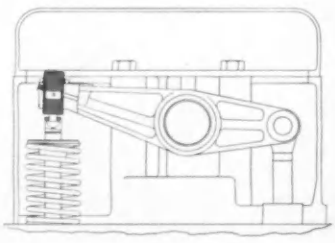
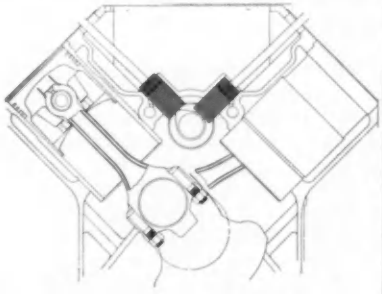


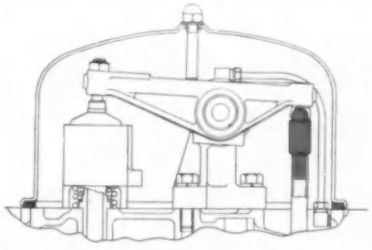
PUSH ROD TYPE FOR COMPRESSION RELEASE APPLICATION



THREADED TYPE ROCKER ARM UNIT



V-8 AUTOMOTIVE HYDRAULIC TAPPET APPLICATION



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of complete valve gear installations for any type of engine . . . passenger car, truck, tractor, diesel, aircraft or industrial.

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tests. Previously, these rotors had corroded and "frozen" during similar tests.

A relatively thin electroless nickel coating will assure the preservation of parts while being stored. Such plates are especially adaptable to parts on which an electroless nickel plate is useful in service such as items stored for future use. A 0.0004 in. thick deposit has been specified for some parts destined for an estimated six-year storage period.

Electroless nickel plates are especially adaptable to salvage operations. Because of the excellent throwing power of this finishing system, it is possible to evenly build up over-sized holes and over-machined surfaces, and is especially adapted to building up threads, splines or serrations.

Design Factors

Although there is no theoretical limit to the thickness of electroless nickel plate, factors of economy provide a production limitation. Production runs have been made in salvage operations on over-machined holes in which plate thicknesses of 0.012 in. have been deposited. Typical recommended thicknesses for electroless nickel deposits are shown in Table II.

TABLE II
Recommended Thicknesses for Electroless Nickel Plate Commercial

Application	Plate Thickness-in.
Indoor protection	0.0005
Mild outdoor protection	0.001
Severe outdoor service	0.0015 to 0.002
Abrasion Resistance	0.001 to 0.003

Thickness tolerances of ±0.00005 in. (extreme tolerances) can usually be obtained. However, tolerances of ±0.0001 in. (normal tolerances) are more economical.

The recommendations of the plater should be followed in determining the service temperature limitations of electroless nickel plates. Even though electroless nickel deposits increase major and minor thread diameters by only two times the coating thickness, the pitch diameter is increased by approximately four times the coating thickness.

Cost Considerations

The unit cost of electroless nickel plate exceeds that of electrodeposited nickel. However, because of its desirable characteristics, its use can become relatively economical when specified for intricate or complicated designs.

(*Turn to page* 170, *please*)

Easy-to-Apply CaPlugs Give "Kid Glove" Protection to Products in Process, Storage and Transit

Amazing multi-purpose closures of tough, flexible Polyethylene protect tubing, threaded fittings and machined parts

Buffalo, N. Y. (JC) Providing "kid-glove" protection for a tremendous variety of products, over 300,000,000 CaPlugs were used by thousands of industries before their 7th birthday. Extremely easy to apply, these adaptable closures are installed with impressive regularity on tubing, fittings, valves, hydraulic components and numerous machined parts.

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MULTITUDE OF USES

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- Oil, Grease and Dust Seals
- Tubing Seals
- Sales Appeal

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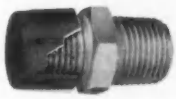
OVER 200 STOCK SIZES

TAPERED CaPlugs

EP & EC Caps and Plugs for Electrical Connectors & Receptacles



CD Threaded Seal and Shipping Caps

PD Threaded Plugs

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". . . features which interest us most: (1) Protection from damage to threads (2) Prevention of dirt entry (3) Price benefit (4) Appearance (5) Ease in installation (6) Easy removal after use."
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"They are much easier to install and consequently effect a considerable saving in installation man hours."
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"They offer an inexpensive, efficient, and secure source of protection . . . and are easily applied and removed."
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MAIL a free assortment of CaPlugs, literature and prices to us immediately, without obligation.

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Power Augmentation With Nitromethane

(*Continued from page 59*)

Influence of Compression Ratio and Spark Advance

Since the question of the effect of engine variables on results always arises, a brief review was made of two other items in addition to jacket temperature and fuel-air ratio reported above. Figure 12 shows results with methanol and methanol plus 20 per cent nitromethane with varying spark ignition timing. These data show that 45 deg before top dead center was a fortunate choice, since optimum power was obtained over a very wide range at this setting.

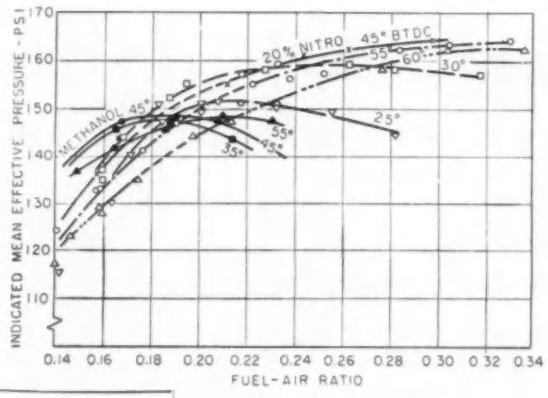


FIG. 12
Effect of ignition timing on performance with nitromethane

Increasing the compression ratio was expected to improve the engine output but aggravate the preignition problem. As shown by Fig. 13, where the dashed portion indicates preignition, no disproportionate effect of compression ratio on preignition was experienced. This helps to explain why nitromethane has been used as successfully in high compression as moderate compression ratio engines.

Discussion of Results

At any power setting obtainable with the base fuel alone, the specific fuel consumption for the doped fuel was always higher. Therefore, the primary advantage to be realized from the addition of nitromethane lies in the greater available power output. A secondary but lesser effect is increased thermal efficiency, and this latter actually contributes to the first.

(*Turn to page 162, please*)

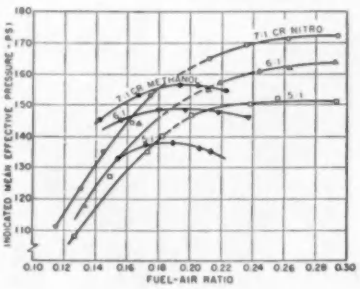
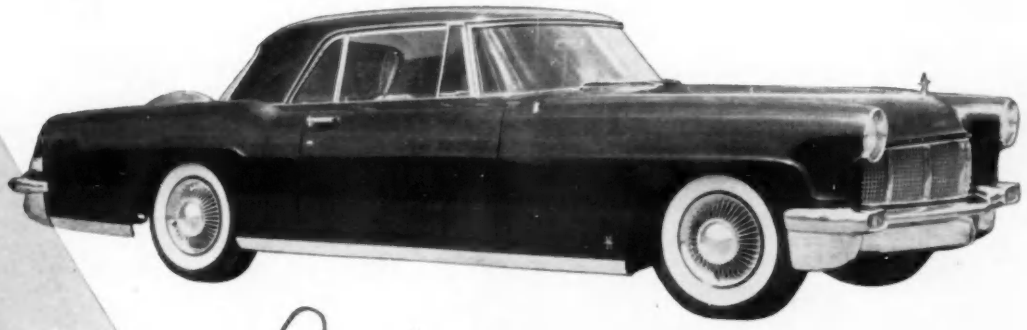


FIG. 13
Influence of compression ratio on performance with nitromethane

Continental—*mark II*



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SHORTIES

The combined milages of all roads and streets in the U. S. is 3.366 million miles. Over these roads and streets motor vehicles travel some 561 billion miles a year.

•

Americans pay over $3 billion yearly in Federal, state and local gasoline taxes. Gasoline tax rates have increased 250 per cent since 1925.

•

Passenger cars account for more than 80 per cent of all motor vehicle miles traveled in the U. S.

•

About 18 per cent of passenger cars in use in the U. S. today are pre-World War II models.

•

U. S. farmers today own seven million motor vehicles and 4.5 million horses and mules, compared to 5.6 million and 11.9 million, respectively, 10 years ago.

•

Truck and bus transportation now provides jobs for 6.725 million Americans or for one out of every 10 employed persons in the nation.

•

The U. S. is producing trucks and buses at a rate of more than one million yearly, accounting for more than half of world production.

•

A division of one automobile manufacturer uses 131 acres of reproduction paper each year to duplicate engineering drawings for distribution throughout the company.

•

Only 71 per cent of U. S. families own passenger cars, even though registration of one car for every 3.3 persons would seem to indicate otherwise. Twelve per cent of all families own two or more cars.

Power Augmentation With Nitromethane

(*Continued from page* 158)

The comparison of per cent increase in power output from the use of nitromethane in the benzene-isooctane mixture to that of the methanol fuel shows that it is more beneficial to include this same concentration in the methanol fuel than in the benzene-isooctane mixture. These latter data have not been plotted, but could be taken from Fig. 9 and would amount to a maximum net increase of about 7 per cent for 20 per cent nitromethane.

TABLE I
Energy Supply and Engine Output

Fuel	Fuel Heating Value Btu per lb	Optimum Fuel-Air Ratio	Heating Value at Optimum Fuel-Air Ratio			Increased Output Per Cent
			Btu per lb Mixture	Btu per lb Air	Increase per lb Air Per Cent	
Methanol	10,260	0.20	2,052	1,642		
20 per cent volume nitromethane in methanol	8,875	0.30	2,662	1,863	13.5	12
50-50 per cent volume benzene in isooctane	19,250	0.082	1,578	1,452		
20 per cent volume nitromethane in benzene-isooctane	15,455	0.115	1,777	1,573	8.3	7

Recalling that the optimum power fuel-air ratio is increased by incorporating nitromethane, a computation has been made to compare the heating values of the maximum power fuel-air ratios for base fuel and base fuel plus 20 per cent nitromethane. This computation assumes constant air flow rate to the engine, which was substantially true. The results are shown in Table I. Note that the increased power output and increased heat rate to the engine closely correspond.

It is also apparent from Table I that there is nothing mysterious about the greater increase in output from nitromethane in alcohol than from the same concentrations by volume in a hydrocarbon mixture. The total amount of nitromethane per unit time is greater in methanol fuel than it would be in hydrocarbon fuels, because more methanol is used per pound of air at the same output. Thus the reason for the greater increase in power output available with the addition of nitromethane to methanol, as compared to the hydrocarbon fuel, lies primarily in the fact that equal volume concentrations of nitromethane in the methanol fuel represent a very much larger incremental increase in the amount of energy supplied by a unit charge of mixture.

The most probable contributing factor to the increased thermal efficiency encountered, and perhaps for part of the increased power output, can be shown by Fig. 14, which illustrates the ideal cycle ABCD; the Otto cycle, which has been accepted as the criterion of spark ignition engine performance. Illustrated thereon also is a normally encountered real cycle diagram, AB′C′D′, as well as another cycle AB′C″D″, which would occur with increased rate of pressure

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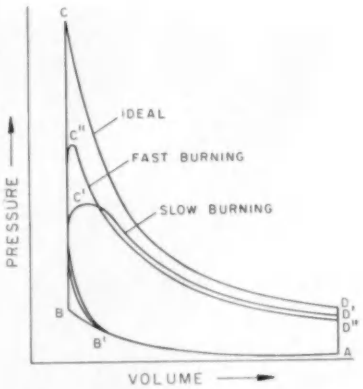


FIG. 14

Ideal and real cycles

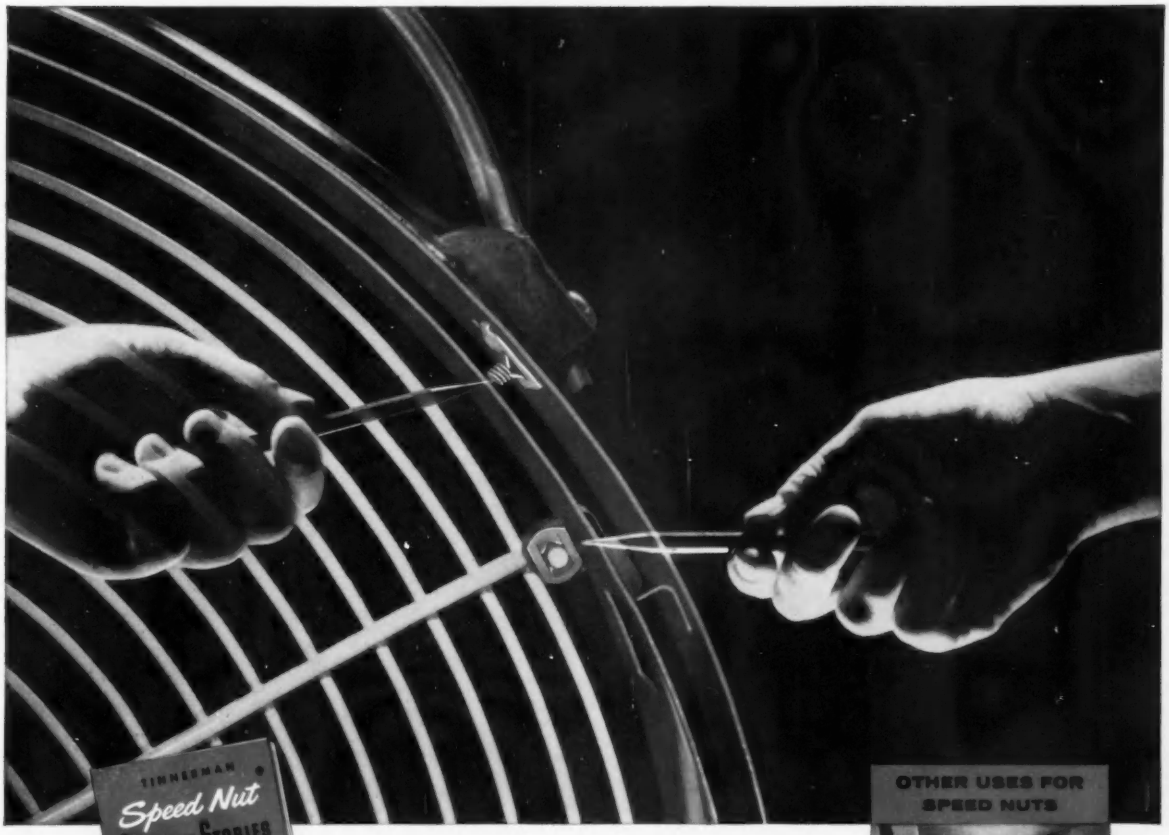
rise during the combustion process. This latter curve, it is felt, is representative of what must result with the addition of nitromethane, while the previous is more probable of a slow-burning fuel such as methyl alcohol. Because of its combustion characteristics and from the proknock evidence, it is felt that any fuel containing nitromethane must react more quickly than the base fuel, and thus cause the combustion process to better approximate the ideal constant volume combustion presumed as a basis for the Otto cycle. This latter, which might be called the flame speed effect, could be pinned down by engine indicator records, but this has not been done as yet, primarily due to the complexities of application of equipment sufficiently reliable to differentiate the change in rates of pressure rise which might be involved.

Conclusions

1. Nitromethane as a fuel additive in either alcohol or hydrocarbons was capable of increasing power output. At 40 per cent nitromethane in methanol this was an increase of 22 per cent indicated or 30 per cent brake output at 75 per cent mechanical efficiency.

2. The amount of nitromethane which could be added to a given fuel was limited by the tendency for the additive to bring about preignition with jacket temperature the largest controlling factor in determining the maximum concentration. In the case of its addition to methanol and for continuous operation, the concentration at 6 to 1 compression ratio, 125 F inlet, 375 F jacket temperature, and CFR supercharge conditions, amounted to 20 per cent by volume. This 20 per cent concentration also was the limiting one when blended in an equal volume benzene-isooctane mix-

(*Turn to page* 168, *please*)



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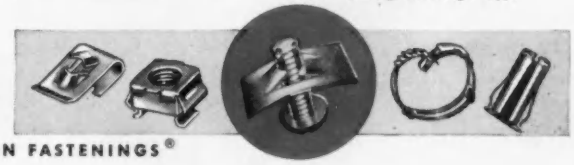

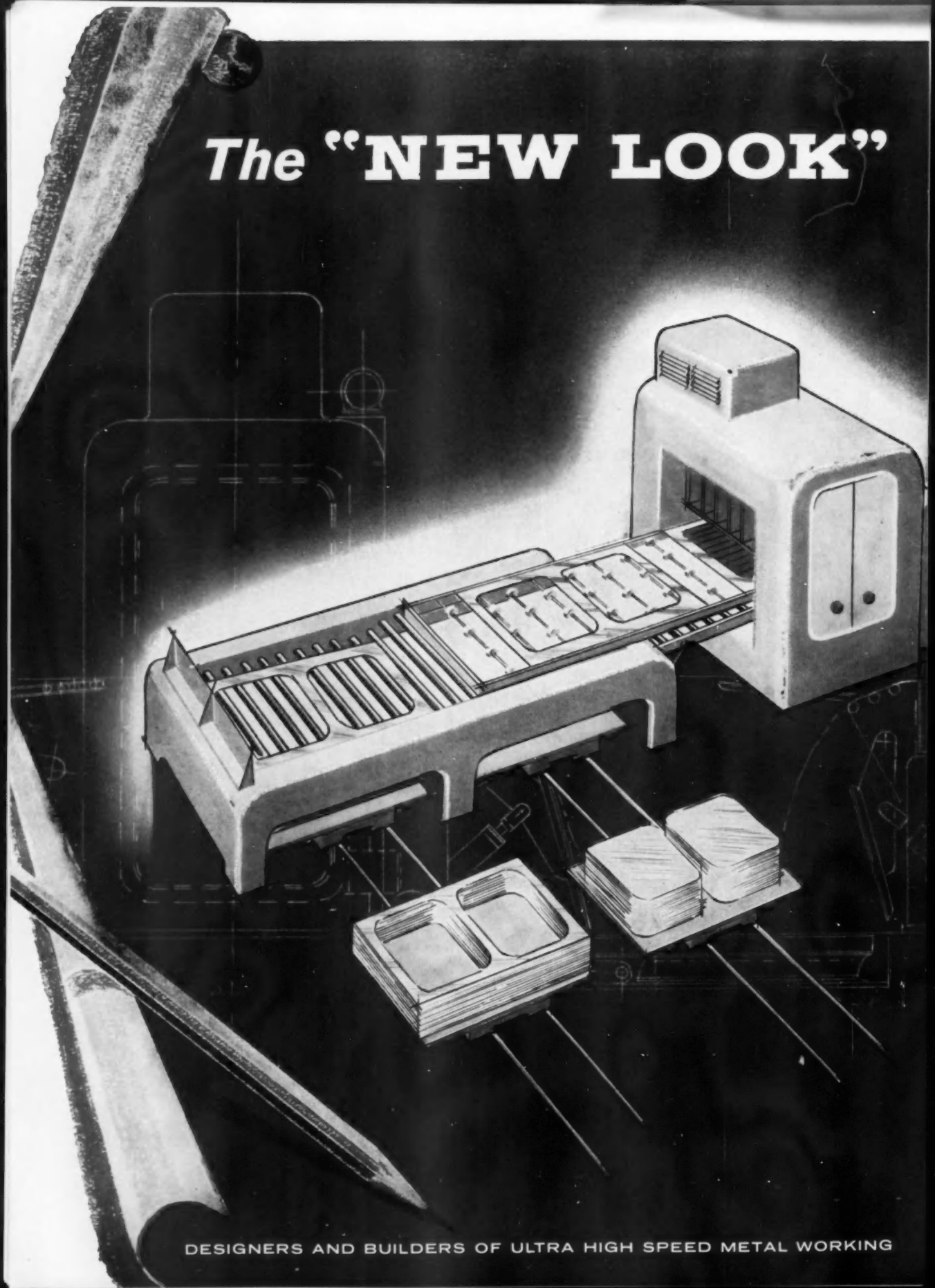
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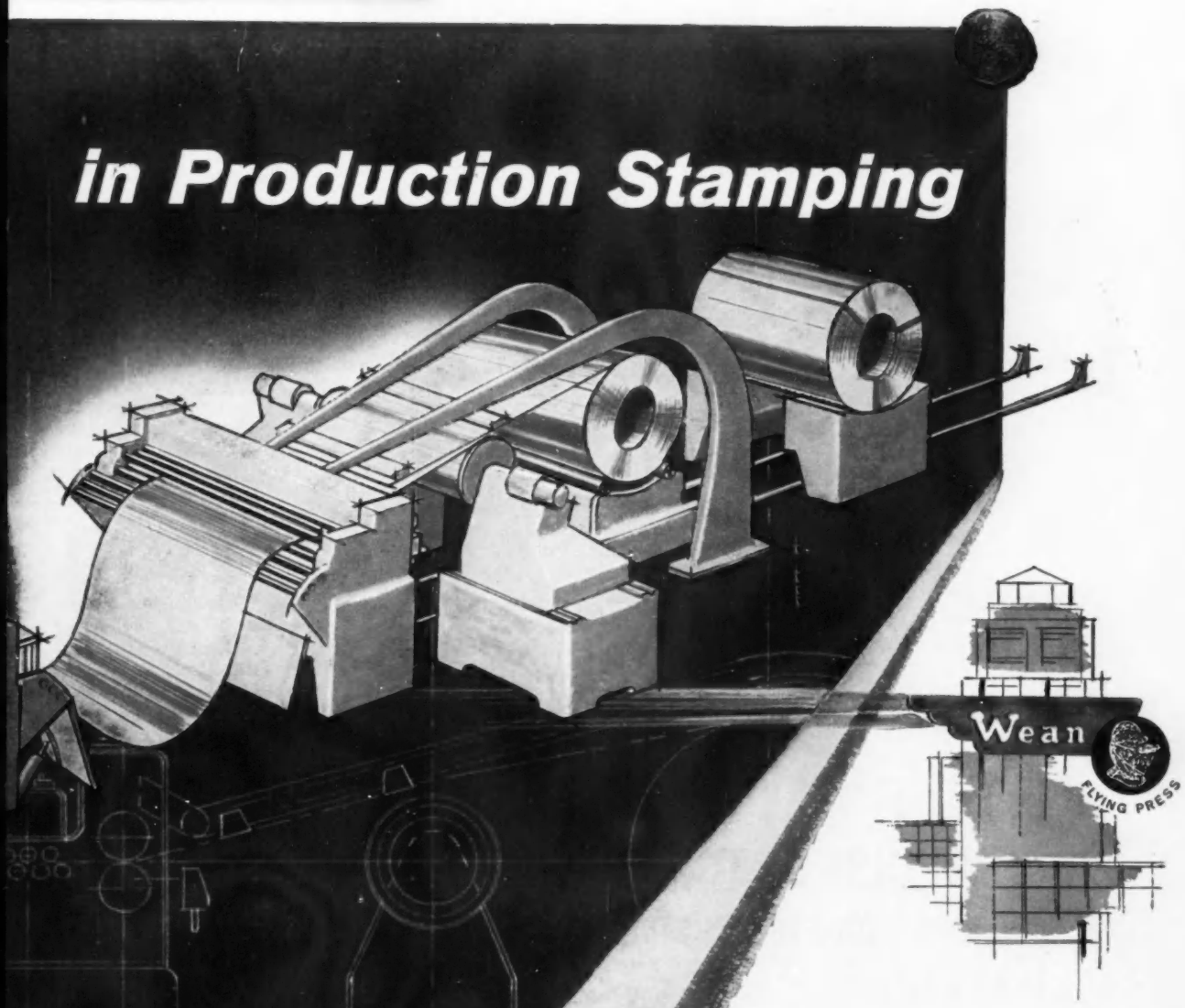

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Power Augmentation With Nitromethane

(*Continued from page* 164)

ture. At 150 F jacket the continuous operation limit was 40 per cent. With water as an additional additive to nitromethane and alcohol, the limit was about 60 per cent.

3. Increased fuel consumption in terms of pounds of fuel per indicated horsepower hour resulted when nitromethane was used as an additive to a fuel. However, an increase in thermal efficiency was also a result of the addition of nitromethane. This apparent divergence is due to the relatively low heating value of nitromethane.

4. Considerable mixture enrichment is necessary in order to utilize the properties of nitromethane at the optimum power output level because of the shift in the resulting optimum mixture ratio. Compensations for this effect are resulting wider fuel-air ratio control limits.

5. Compression ratio appears to have only a small effect on the fuel-air ratio range within which preignition can be expected.

6. More benefit can be derived by inclusion of nitromethane in alcohol than in hydrocarbon fuel.

7. The increase in power from nitromethane can be accounted for by the increased specific energy of the fuel-air mixture.

REFERENCES

[1] Zwicky, F., and Ross, C. C., "Nitromethane as a Monopropellant," S.A.E. Journal, Vol. 57, No. 6, June 1949.

[2] Klein, F. L., "Fuels for Sets," S.A.E. Journal, Vol. 55, No. 12, December 1947.

[3] Albright, R. E., Nelson, F. L., and Raymond, L., "Utilization of 2, 2-Dinitropropane as a Cetane Number Improver," Ind. Eng. Chem., Vol. 41, p. 929, May 1949.

[4] Bogin, C., "How the Coating Industry is Using the Nitroparaffins," Paint, Oil and Chemical Review, Aug. 27, Sept. 10, Sept. 24, Oct. 8, 1942.

[5] Hass, H. B., "Recent Developments in Nitroparaffins," Ind. Eng. Chem., Vol. 35, p. 1146, Nov. 1943.

[6] Scheer, W. E., "Industrial Applications of the Nitroparaffins," Chem. Ind., Apr. 1943.

[7] Brown, N. G., "Latest Trends in Hot Rods," Auto. Ind., Vol. 111, No. 2, p. 54, July 15, 1954.

[8] Jackson, R. T., "Analysis of Results at Indianapolis 500," Auto. Ind., Vol. 112, No. 12, June 15, 1955.

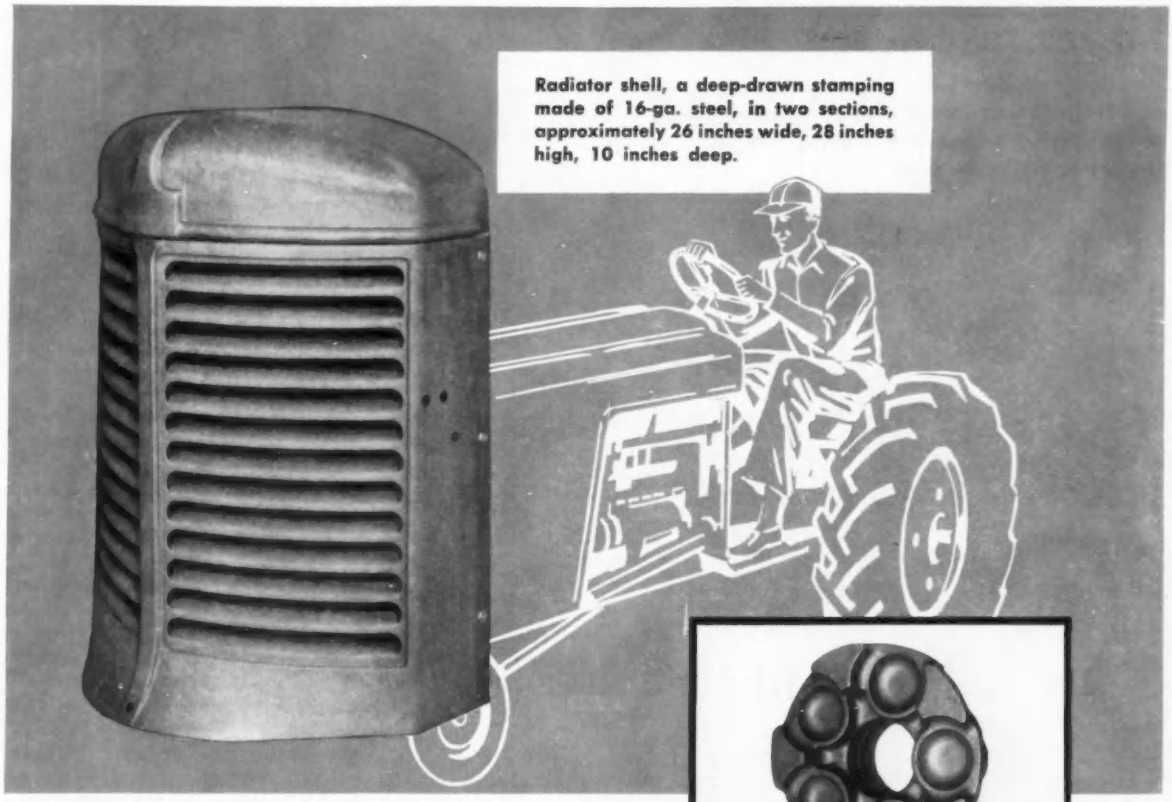
[9] Hass, H. B., and Riley, E. F., "The Nitroparaffins," Chem. Rev., Vol. 32, No. 3, June 1943.

[10] Gwinner, W. C., and Watts, C. E., "Handling of Nitroparaffins," Technical Data Sheet No. 10, Commercial Solvents Corporation, 260 Madison Ave., N. Y. 16, N. Y., Aug. 1, 1952.

[11] Machle, W., Scott, E. W., and Treon, J., "The Physiological Response of Animals to Some Simple Mononitroparaffins and to Certain Derivatives of these Compounds," J. Ind. Hyg. and Tox., Vol. 22, No. 8, p. 315, Oct. 1940.

[12] Powell, R. E., (private communication), University of California.

[13] "ASTM Manual of Engine Test Methods for Rating Fuels," American Society for Testing Materials, Philadelphia, Penn., 1948.



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(*Continued from page* 156)

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Cleaning—Parts must be clean before immersion in the plating bath, therefore, the cost of plating dirty or scaled parts will include the required cleaning costs. The removal materials such as weld scale and brazing flux from the inner surfaces of tubular or cylindrical parts presents peculiar problems heretofore rarely encountered in preparing parts for conventional electroplating.

Exposed Area—The greater the exposed area to be plated, the greater the total cost per part. For example, it will cost more to plate a piece of open tubing than to plate a piece of bar of equal outside diameter and length.

BOOKS . . .

HIGH-SPEED COMBUSTION ENGINES, *by P. M. Heldt, published by Chilton Co., Chestnut & 56th Sts., Philadelphia 39, Pa. Price, $12.00.* The steady popularity of this comprehensive treatise on the combustion engine is responsible for the many editions that have been printed since its first appearance in 1916. This new sixteenth edition has been considerably revised to reflect the changes in engine design and performance that have occurred in the seven years since the last extensive revision. Recent developments such as the increase in compression ratios, improvements in motor fuels, the increasing use of liquefied petroleum gases as motor fuels, and the new types of testing equipment are adequately covered. Perhaps the most valuable addition, as far as the general reader is concerned, is the chapter on the thermodynamics of the combustion engine which appeared in earlier editions. It has now been restored because, as the author contends, a general treatment of the subject such as is given in most colleges does not cover the combustion-engine phase completely enough.

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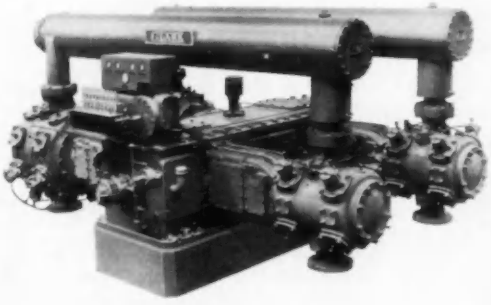

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Looking Ahead 25 Years in the Passenger Car Business

(*Continued from page* 63)

As we have mentioned, this criterion is not subject to exact formulation, being based upon available scrappage estimates rather than actual scrap records. On the other hand, it marks the best statistical evidence that is available.

What can we say about future trends? This is important since it affects vitally the final estimates that may be made. Table II gives a choice of three different assumptions: an average life of 12 years, 11 years, and 10 years. We have arbitrarily chosen an average life of 11 years. The tabulation shows clearly how the final results would be affected by any one of the other choices.

Column one, Table II, is calculated from Table I and indicates the average passenger car registrations during selected five-year periods. The last three columns represent the choices for average yearly replacements during each period under study.

The remaining variable that must be accounted for is the rate of motor car exports, since that is an additive quantity in our equation. In the past few years exports have run around 200,000 vehicles a year. For our purpose, it is necessary to assume that the rate may remain more or less fixed at say 200,000 units. In any event, this factor does not loom as large percentage-wise in our calculation.

Final Estimate

With these calculations as a starting point, we are prepared to make the final estimates of passenger car production rates during the four, five-year periods under discussion.

Let us review for a moment the data available and their influence on the final results. We have developed in Table 1 an estimate of passenger car registrations, by five year increments, for the 20-year period 1955-75. With this as the starting point we shall develop a pattern of average yearly passenger car production during the four, five-year periods under study.

To this end, we shall have to consider the following factors that control the situation:

1. Annual increment due to population growth.
2. Replacement market due to scrappage.
3. Amount of yearly export.

Table III shows the method of arriving at the annual increment. Here the total increase in passenger car registrations, Column 1, is calculated for each five-year period, from Table 1. Column 2, the estimated annual increment, then is obtained by dividing Column 1 by five.

The annual replacement market is calculated from the values in the last three columns of Table II, as explained earlier, using arbitrarily an average car life expectancy of 11 years.

The amount of export business is arbitrarily assumed as being an average of 200,000 yearly, as discussed earlier.

Table IV then represents the summation of these significant elements.

(*Turn to page* 176, *please*)

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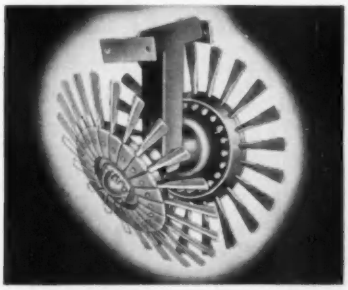

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Looking Ahead 25 Years in the Passenger Car Business

(*Continued from page* 172)

Column 1 is the factor of annual growth; Column 2, the replacement market; Column 3, the amount of export.

The grand totals—estimates based upon the many assumptions described in detail earlier in this paper—then give the average yearly production during the designated five-year periods. It is noteworthy that by 1975 annual production may be at the rate of 8,330,000 passenger cars.

It is essential at this point to emphasize that automotive industry statistics usually are given in terms of total vehicle production, i.e., cars and trucks and buses. This must be borne in mind in comparing the estimates in this study with figures from other sources. We mention this because our assignment was specifically in terms of passenger cars and not total vehicle production.

Just as a matter of interest, if truck production were to attain a level of say, 2-million units by 1975, then total vehicle production would be at the rate of over 10-million vehicles a year.

The foregoing is an abstract of a paper presented by the author before the Division of Chemical Marketing and Economics at the National Meeting of the American Chemical Society, Dallas, Texas, April 10, 1956.

BOOKS . . .

STEELS FOR THE USER, *by E. T. Rolfe, published by Philosophical Library, 15 E. 40th St., New York 16, N. Y. Price, $10.00.* In his introduction, the author, an Englishman with long experience in the metallurgical industry, stresses the fact that this is a highly practical book on carbon steels written primarily for the engineer and user, rather than for the student. Its aim is to bridge the present gap between science and practice for carbon steels in industry. The scientific aspects of the various processes are comprehensively treated, but always with an abundance of data and examples from actual service. The work deals mostly with carbon steels, with particular emphasis on such hitherto neglected matters as the relationship between carbon content and mechanical quality, and the industrial use of bright and free cutting steels. Alloy steels are discussed only for applications for which carbon steels are unsuitable, as with nitriding steels and those for high temperature services.

BUSINESS PULSE

(*Continued from page* 98)

Elements of Uncertainty

While there is no doubt that the optimistic point of view has been buttressed by recent developments, it is well to appreciate that there are still some elements of uncertainty in the economic situation which should be taken into account.

First of all, it is necessary to distinguish between favorable omens on the one hand and the actual course of business activity on the other. The fact is that business at the moment is still exhibiting rather static tendencies. In February, the latest period for which data are at all comprehensive, both production and retail trade performed in rather treadmill fashion. The Federal Reserve index of industrial output, on an adjusted basis, ran at 143 per cent of its 1947-49 average, unchanged from January. Indeed, the index has been at this level since last October, when it was 144. Preliminary estimates indicate that retail sales actually ran some two per cent below January, after allowance for seasonal factors and trading-day differences.

Outlook for Automobiles

It is significant, moreover, that the automobile outlook is still hazy. March sales appear to have run considerably above those in the earlier part of this year, but it seems questionable that the increase was appreciably more than of seasonal magnitude.

This quickening of sales would undoubtedly be a source of much more gratification if it were not for the continuing large volume of inventories and the memory of last year's sensational sales. The fact is that, despite the greater bustle in showrooms, manufacturers have not responded with any sharp advance in rates of output. Instead, they have tended to hold production in check in the hope of effecting some reduction in dealers' inventories.

The present belief is that March figures for car sales will show that at least modest progress has been made in this direction. For the time being, however, there is no evidence of anything that could be termed a spectacular improvement in the inventory situation, which means that the eventual impact of automobile activity on the course of business this year remains in doubt.

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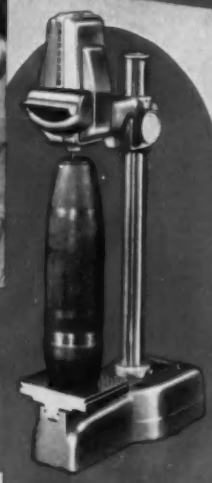

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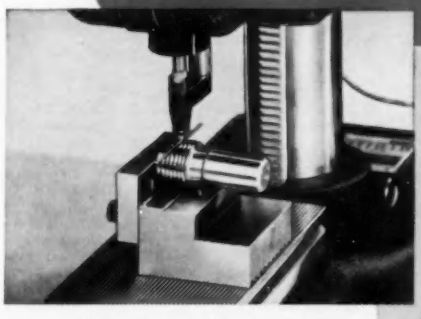
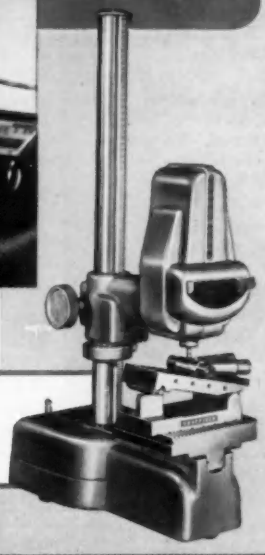


Measuring the pitch diameter of tapered threads.



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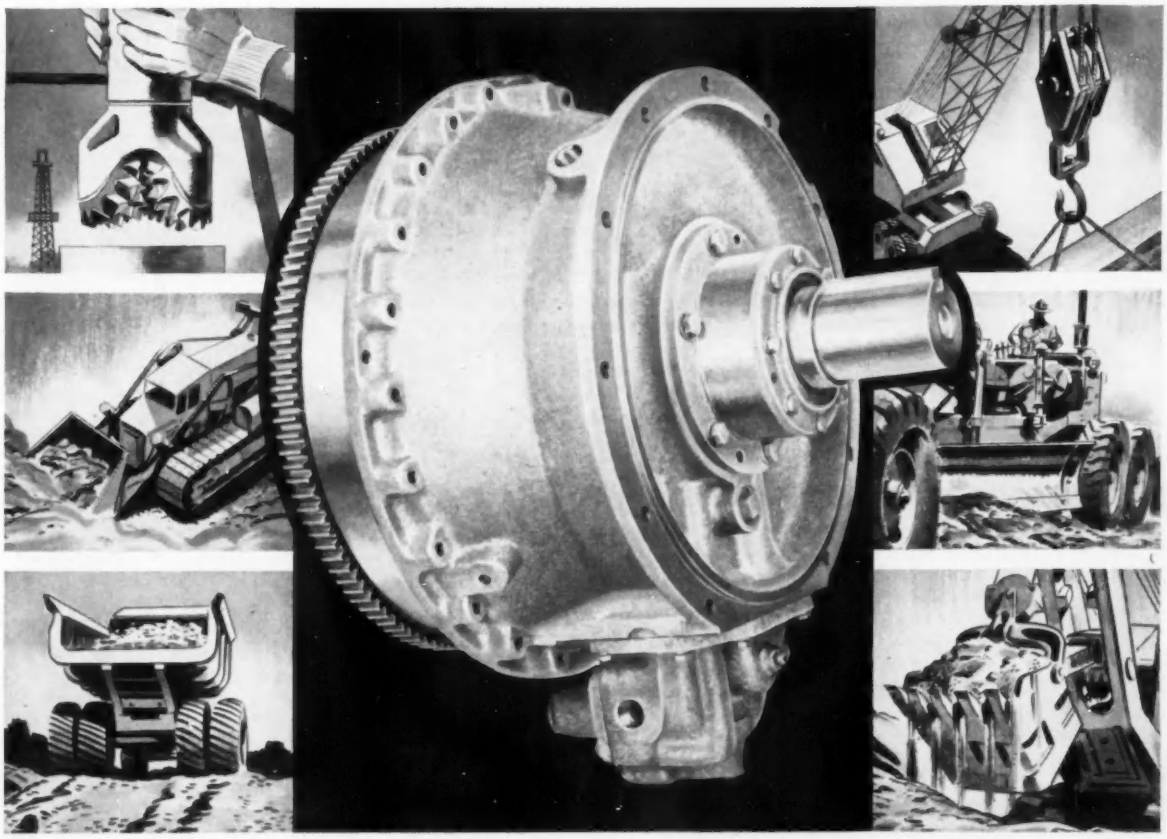
naturally raises the question whether the recent improvement in general business sentiment is solidly based. Specifically, it suggests that the elements of strength which seem to be implied by the recent survey disclosures may have been over-generously appraised. Yet those who are most optimistic would undoubtedly argue that reversals of trend usually take some time and that there is no particular significance in the failure of business to show evidence of expansion to date. Unfortunately, as is almost always the case, such issues cannot be resolved at present, which means that the business outlook is still characterized by a large element of obscurity.

BOOKS . . .

METALS HANDBOOK, 1955 SUPPLEMENT, *published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. Price, $6.00.* This supplement to the ASM Metals Handbook follows the general plan used in the 1954 supplement, which is to present practical information on a variety of metalworking subjects that require up-to-date reference material. The 21 articles, written by 19 technical committees of the Society, comprising 179 authors, are divided among four main sections: Metals and Applications, Design and Application, Processing and Fabrication, and Testing and Inspection. Typical subjects are the selection of aluminum alloy castings; selection of gray cast iron; selection of electrodes for manual arc welding of low carbon steel; induction hardening and tempering; flame hardening; surface finish; gas carburizing; metal cleaning costs; and radiography of metals.

THE LORCO METHOD OF PRECISION BARREL FINISHING FOR METALS AND PLASTICS, *published by Lord Chemical Corp., 2068 South Queen St., York, Pa. Price, $0.50.* Consisting of 44 pages, this manual covers the subject of tumbling and describes techniques developed around a series of 27 chemical compounds, used with or without fused aluminum-oxide chips and other media. Two of the six chapters cover general procedures for metal parts, ferrous and non-ferrous; a third chapter is devoted to the new technique of barrel finishing of plastic parts. The remaining three chapters are devoted to compounds and their specific purposes; media, including all-purpose fused aluminum-oxide chips, aluminum-oxide abrasive spheres and triangles, steel shapes, etc.; and the equipment needed for precision barrel finishing.

HANDBOOK OF ENGINEERING MATERIALS, *by John Seastone and Douglas F. Miner, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $17.50.* This new handbook is aimed at helping the engineer make a proper selection of materials, and was written by a group of over 50 specialists, each an expert in a particular field of materials technology. It discusses properties such as electrical, thermal, physical, chemical and appearance, and provides general information on specifications and standards, statistics in the application of materials and mathematics and physical tables. Covered are metals, special-purpose alloys, details of non-metals and construction materials.



Versatile is the word for the Torqmatic 500

NAME the gasoline- or Diesel-powered equipment you buy or build in the 100 to 350 horsepower range and it's a sure bet that it's available—or will be soon—with the Series 500 TORQMATIC, *the world's most versatile torque converter.*

Scores of manufacturers—making such varied equipment as cranes, shovels, drilling rigs, log loaders, ditchers, industrial locomotives, scrapers, graders and off-highway trucks—specify the TORQMATIC 500 in the equipment they build, and with good reason.

In one standard housing it gives them a choice of 4 ranges, 7 torque ratios—*and* permits operators to standardize on *one* type of converter for *all* their equipment within the horsepower range.

In many applications it permits the use of lower horsepower engines with no reduction in *working* power because the TORQMATIC 500 multiplies engine torque anywhere from 250% to 360%—*and* means equipment owners will cut operating costs and get more work done per shift.

For full details on the Series 500 TORQMATIC Converter in your equipment write to:

Allison Division of General Motors
Box 894A, Indianapolis 6, Indiana

GM TORQMATIC *Allison* TORQMATIC DRIVES

New European Automobiles Displayed at Geneva Show

(*Continued from page* 61)

Although the Italian Viberti Monotral Golden Dolphin Coach is not, at present, a practical vehicle, its importance in European coach design is already accepted. The general shape resembles an aircraft fuselage, and stabilizing fins of considerable size have been considered necessary for both lateral and vertical stability at the maximum speed of which the vehicle is capable. The lower half of the body is made of one piece of plastic with the exception of the right-hand side door which ends at the height of the window sill. Polarized transparent material with heat-absorbing qualities is used for the upper half of the shell and is broken only by very thin pillars, giving exceptional visibility throughout. The Fiat turbine, of which no further details are released for the time being, will be fitted amidships under the floor, as soon as it is completed. In the meantime a 190-hp OM-Saurer Diesel engine will be used for the test runs. The necessary air ducts for the turbine are provided in the floor, and their walls are used for stiffening purposes. All four wheels are independently sprung.

Another new coach is the Saurer Postal 36 passenger vehicle 3 DUX. This has a new supercharged Diesel engine with a mechanically driven blower. This is fitted with a blow-off valve which opens partially from the maximum torque rpm, diminishing inlet pressure. The engine has a bore of 4.92 in., a stroke of 4.72 in. and a piston displacement of 610 cu in. Maximum output is 180 hp net at 2000 rpm, and maximum torque attains the imposing figure of 650 lb ft between 1000 and 1200 rpm. The engine and the transmission are mounted separately under the floor.

A new feature has been added to the Citroen DS 19. This is a manually controlled level adjuster which permits five different positions of the vehicle structure in relation to the ground. A small lever placed in front of the left front door pillar is connected mechanically with valves governing the quantity of hydraulic fluid admitted in the front and rear units of the well-known pneumo-hydraulic suspension. For changing wheels, the car is first placed in the high position; a jack is fitted in the respective lateral holes, and the rear of one side is raised by putting the adjusting lever into the low position. Ground clearance can be varied in five positions from approximately 3 to 12 in. Over poor road surfaces the two intermediate high positions can be used for running without excessively limiting road wheel movement. In the highest position snow drifts of considerable height may be negotiated.

Installation of the most modern equipment, doubling our engineering and other specialized personnel are but some of the factors contributing to our newly increased productivity and efficiency.

Long's experience in quality manufacture includes over a half century of volume production for American industry. The progressive policies of Borg-Warner—of which we are a Division—set new goals in expanding our engineering and production service.

We direct you to the advantages of meeting your cost and delivery requirements through recent developments and new applications of our products. We're eager to tell you about them in detail.

NEW LONG RADIATOR BOTTOM TANK OIL COOLER

Simply and economically placed in the lower tank of the radiator this new Long-designed oil cooler in one neat out-of-the-way package maintains desired oil temperature for engine and/or transmission. They are available in a variety of lengths, thicknesses and multiple wafers, and are now in volume production at Long.

LONG-BUILT RADIATORS

Long radiators make the most efficient use of material and provide a more rugged construction at competitive prices. Long's outstanding engineering facilities are available to you for design and building of any type of radiator or heat exchanger.

LONG B-W BORG-WARNER

LONG ®

LONG MANUFACTURING DIVISION, BORG-WARNER CORPORATION

12501 DeQuindre Street, Detroit 12, Michigan

Also: Windsor and Oakville, Ontario

THE STANDARD OF QUALITY AND PERFORMANCE SINCE 1903

AI TABLOID

(*Continued from page* 37)

Doehler-Jarvis Div. of National Lead Co. has announced an expansion program to increase the capacity of its die casting facilities by 20 million lb of aluminum and 15 million lb of zinc per year . . . Gunite Foundries Corp. has announced a $1 million expansion program for increased production of automotive cast-steel wheels, brake drums, and wheel assemblies.

* * *

The Army and Glenn L. Martin Co. have announced development of the Missile Master electronic system to improve anti-aircraft defense.

* * *

Dow Chemical Co. is adding four new members to its Styron family of plastics.

* * *

White Industries, wholly-owned subsidiary of Mack Trucks, Inc., has become Mack Electronics Div., Inc. . . . Intercontinental Electronics Corp. is name of new company formed to make available to U. S. markets developments in French electronics.

* * *

Wright Air Development Center has anounced successful cold extrusion of titanium.

* * *

Petroleos Mexicanos is considering the possibility of manufacturing high-octane gasoline for automobiles.

* * *

Westinghouse Electric Corp. has announced plans to build a nuclear materials testing reactor near Waltz Mill, Pa., instead of at Blairsville, Pa., as announced previously. . . . North American Aviation, Inc., will build a $250,000 atomic research reactor for Atomic Energy Research Institute in Japan.

* * *

Norton Co. has acquired controlling interest in a sandpaper plant in Argentina.

* * *

Bell Aircraft Corp. and New York Airways are discussing development of a 25-passenger helicopter that would be powered by three gas turbine engines.

(*Turn to page* 186, *please*)

Setting safer paths for little feet

3M ADHESIVES

America's school buses carry especially precious cargo. That's why their designers and manufacturers place great emphasis on all details pertaining to passenger safety. Safe, non-slip flooring is one of the essentials.

To anchor floor matting to the steel floors of their school buses—and to *keep* it anchored, smooth and "trip-free"—many bus manufacturers have standardized on a 3M rubber-based adhesive. They chose it for safer floors . . . *and* because they need fast application and a quick, strong, lasting bond that will stand up under vibration, temperature changes and strong cleaning solutions.

See what adhesives can do for you . . .

3M's rubber-based adhesives provide a swift, low-cost way of joining a variety of materials. Other 3M adhesives, coatings and sealers have been created to do very specific jobs in just about every industry you can name. Like to see some more examples of what other companies are doing with 3M products? Call in your nearest 3M Field Engineer. Or, for more detailed facts on 3M products serving industry today—write to 3M, Dept. 314, 417 Piquette Avenue, Detroit 2, Mich.

ADHESIVES AND COATINGS DIVISION **MINNESOTA MINING AND MANUFACTURING COMPANY**

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AI TABLOID

(*Continued from page* 184)

Solar Aircraft Co. recently demonstrated its Navy personnel boat powered by a 500 hp-Jupiter gas turbine engine. . . . Bristol Aero-Engines, Ltd., is developing a marine version of the Bristol Proteus turboprop engine.

McDonnell Aircraft Corp. has been awarded an additional Navy contract of $22.5 million for development of the F4H-1 supersonic all-weather attack fighter. . . . Chance-Vought Aircraft, Inc., holds a new Navy contract for production of $45 million worth of F8U-1 Crusader jet fighters.

* * *

Clearing Machine Corp., Inc., offers for showing a sound-color movie based on its line of automatic, transfer-feed presses. . . . American Zinc Institute has produced a new sound and color motion picture entitled "Zinc Controls Corrosion."

Commercial Filters Corp., has announced the merger of two well-known filter lines — Honan - Crane and Michiana—to form a new subsidiary, Indiana Commercial Filters Corp.

* * *

Standard - Triumph Motor Co., Inc., has moved to larger offices at 122 East 42nd St., New York 17, N. Y. . . . Dow Chemical Co. has opened a new office in Camden, N. J.

* * *

Houdaille Industries, Inc., has acquired control of North Jersey Quarry Co. . . . Nuclear Corp. of America has acquired the assets and business of Central Sales & Mfg. Co.

* * *

Shallway Corp. has established a shell molding research and development center at Connellsville, Pa. . . . Alan Wood Steel Co. will erect a new factory for its Penco Metal Products Div. at Oaks, Pa.

* * *

Kollsman Instrument Corp. has developed an integrated flight instrument system.

* * *

Wayne Univ. College of Engineering will hold an exhibition of progress in engineering education and research on April 27 and 28.

* * *

General American Transportation Corp. will erect a research and developmental laboratory in East Chicago, Ind., for its Plastics Div. . . . Koppers Co., Inc., will join Brea Chemicals, Inc., in the construction and operation of a new polyethylene plastic plant near Los Angeles, Calif.

* * *

Vinyl Fabrics Institute is new name of the Coatings & Film Association.

* * *

Alloy Precision Castings Co. has established new departments for wax investment castings and shell molding operations.

* * *

Republic Aviation Corp. has sold all rights to the Seabee light amphibian aircraft to the J. K. Downer firm of Saginaw, Mich.

* * *

Dow Corning Corp. has increased its silicone production and cut prices accordingly.

* * *

North American Aviation, Inc., has established Atomics International as a separate division to handle all of the company's nuclear engineering and manufacturing operations.

Inspector at Rockford Acromatic Products Company checks a completely machined universal joint trunnion bearing.

The special-section bar stock as rolled by Bethlehem, together with the finished part, are shown below.

This bearing measures 2 5/8 in. in width by 1 3/8 in. in height.

Auto Parts Supplier Cuts Costs with Special Sections

Here's a technique that could help you cut production costs if you make a product in large quantities. One producer who has used it with outstanding success is Rockford Acromatic Products Company, of Rockford, Ill., specialist in automatic-machine products.

This company is busy turning out universal joint parts from Bethlehem special-section bar stock. Formerly made from individual blanks, they are now produced at far less cost. Feeding long lengths of carbon-steel bar special sections into their high-capacity automatic machines, Rockford Acromatic produces finish-machined bearings at the rate of 1 every 18 seconds per machine.

Bethlehem special sections are supplied in bar lengths that are especially suitable for automatic machining. But however your product is made, it may well pay you to investigate the use of special sections. By designing with a special section in mind, you can provide weight and strength where it is needed, while eliminating excess metal. You can get a high-quality product with reduced machining and scrap loss. This may mean big savings in your operations.

Let us give you more information about hot-rolled special sections, and how they could help you cut production costs. Please call the Bethlehem sales office nearest you.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

MEN *in the* NEWS

(*Continued from page* 41)

Phillips Control Corp. — **Fred L. Schwab** was named general sales manager, and **Stanley McClean** was chosen works manager.

Van Norman Automotive Equipment Co.—**Philip D. Moulton** is now general sales manager.

Progressive Welder Sales Co. — **Ray W. Hieden** has been appointed director of manufacturing, and **Ronald L. Loup** has been named director of engineering.

Jack & Heintz, Inc.—**Carl F. Herbold** has been made assistant to the president.

A. O. Smith Corp.—**Roy A. Dingman** is now vice-president in charge of industrial relations.

Wagner Electric Corp., Automotive Parts Div.—**F. G. Wilson** and **F. W. Hill** are now sales manager and western sales manager, respectively.

National Vulcanized Fibre Co.—**L. Robert Clinton** has been promoted to purchasing agent.

Wagner Brothers Inc.—Bruno Leonelli has been elected vice-president.

Waukesha Motor Co. — **J. Roger Merriam** has been made assistant chief engineer.

Clearing Machine Corp.—**Paul Eckstein** is now Detroit sales representative.

American LaFrance Corp.—**George R. Hanks** was elected chairman of the board and chief executive officer, and **James F. Connaughton** succeeds him as president.

Link Aviation, Inc.—**Howard L. Kelly** has been named vice-president in charge of sales; **Byron S. Brokaw**, first assistant secretary; and **Harold H. Warden**, commercial sales manager.

Du Pont Co.—**John S. Young** is now automotive industry specialist for the plastics sales section.

When you need a dependable source of conventional oil seals, or engineering help on new seals to meet unique conditions, call your National Oil Seal Applications Engineer. He's a specialist in seals, factory trained and a veteran at his business. Whether your seals can be shipped from stock, made from existing tools, or require new engineering, he'll give you a fast, accurate and realistic answer.

Your National Applications Engineer is backed by the productive capability of four big NMB plants, and 35 years of oil seal specialization. Call him while your new design is still on the drafting board—the best time to specify seals. His telephone number and address are listed above.

NATIONAL
OIL & GREASE SEALS
O-RINGS SHIMS
Product of the world's largest exclusive manufacturer of oil seals

NATIONAL MOTOR BEARING CO., INC.
Plants at Van Wert, Ohio, Redwood City, Downey and Long Beach, Calif.
General Offices: Redwood City

3676

Doehler-Jarvis help REGINA floorwaxer

Waxing the floor once took plenty of elbow grease.

Now machines do the muscle work. Do it as you used to – bearing down . . . rubbing hard.

So a mechanical waxer needs a certain amount of weight – as well as speed.

And remember this! A floorwaxer's lot is not a happy one. It should be rugged. What's more, though it hides in a broom closet all its life, it has to look like a million on the sales floor. Compete pricewise, too.

One company . . . The Regina Corporation . . . has done an outstanding job of meeting these requirements. Today, something like four out of every five floor waxers sold are made by Regina.

Regina's methods are deceptively simple. Consider their use of Doehler-Jarvis zinc die castings for base, motor housing, handle swivel, and cover. This one policy, alone, accounts for many of the sales advantages their waxers enjoy.

Take weight! Zinc provides it . . . in just the right measure for efficient polishing combined with easy handling. Die casting helps Regina distribute weight evenly and concentrate it low for balance.

Take strength! Zinc has it and die casting exploits it . . . permitting metal to be concentrated where stresses accumulate, reduced or eliminated where strength requirements diminish or disappear.

Three of Four Big Sales Points stressed by Regina to dealers are founded on the use of Doehler-Jarvis zinc die castings . . . eye catching finish (good die-cast surfaces), efficient polishing action (well-placed weight), rugged serviceability (high-strength metal).

zinc die castings add weight to their sales story

Take appearance! Die-cast zinc surfaces enhance almost any finish you want to name . . . including the new enamels in pastel shades. To get a basic change in shape, as for a new model, Regina simply designs a new die-cast cover to fit.

Take cost! Regina and Doehler-Jarvis engineers work production costs down pretty far. In current models, machining is reduced to light reaming of the bearings, a combination turning operation and the tapping of three holes. Cast-in holes speed assembly with self-threading screws. To save still another operation, servicing instructions are die-cast in bas-relief letters.

There are important cost reduction implications, too, in Doehler-Jarvis service. Regina puts it this way, "We've done business with Doehler-Jarvis for over twenty years. We can count on prompt action when it's called for . . . and when they set up a shipping schedule they hold to it."

This practical type of relationship has been duplicated many times between Doehler-Jarvis and its customers. For Singer, Black and Decker, York, AMF, Underwood and many another blue chip company it's paid off again and again . . . just as it can pay off for you.

So if you are designing a new product or model, look into the possibilities of die castings . . . Doehler-Jarvis die castings.

Doehler-Jarvis

Division of National Lead Company

General Offices: Toledo 1, Ohio

In Canada:

Barber Die Casting Co., Limited

Hamilton, Ontario

DOEHLER-JARVIS

*Reg. U. S. Pat. Off.

backed by a 50-year
record for dependability...

★ ★ ★ ★

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including complete drive equipment—designed, engineered and manufactured to your specifications

...all from one manufacturing source!

For half a century, Stewart-Warner has made quality instruments and gauges for automotive, industrial, marine and agricultural applications.

Many leading manufacturers capitalize on this unmatched experience and know-how by specifying Stewart-Warner equipment *exclusively.*

The complete Stewart-Warner line offers you a wide choice of gauges, speedometers, tachometers, and tachourmeters. Entire panels can be custom-made to your own specification. Everything you need for a complete installation—including flexible shafts, gears, and adapters—are available. Let Stewart-Warner supply *all* your instrument needs—*from one dependable manufacturing source.*

For further information, write:

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Dept. M-46, Original Equipment Sales
1826 Diversey Parkway, Chicago 14, Illinois

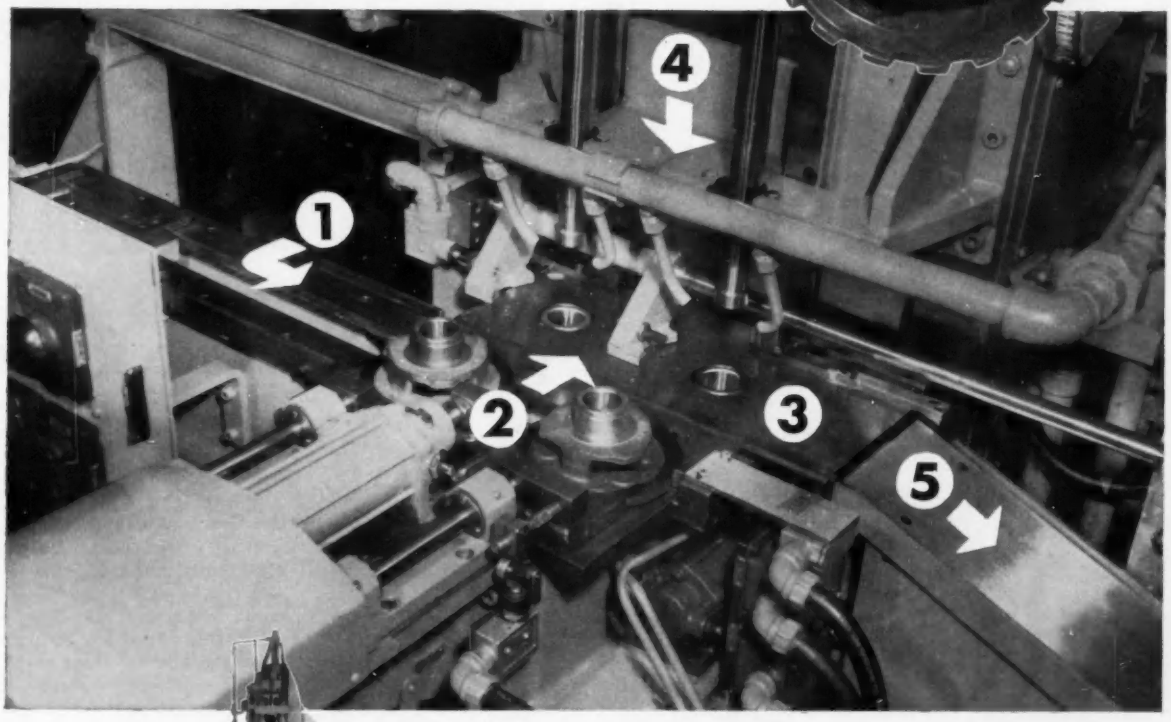
STEWART SW WARNER

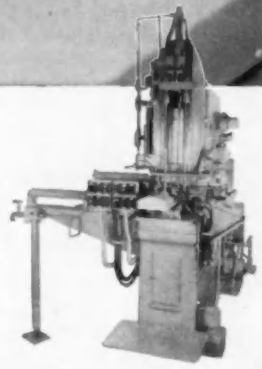
more about **AUTOMATION** by *American*...

SPLINE BROACHING

of transmission part

MADE FULLY AUTOMATIC





Fully automated broaching by American here results in an output of 380 parts per hour (at 100% efficiency). Regardless of what degree of automation you require, American is prepared to design and build the broaching machine, fixtures and broaches that will fit your production picture best. Write details of your requirements today.

1 Hydraulic fixture, interlocked to the machine cycle, transfers parts laterally, two at a time, from conveyor to position in front of the broaches.

2 Hydraulic pusher carries parts into broaching position.

3 An automatic skid plate then lowers and seats the parts over the thrust bushings.

4 Spline broaches, 36″ long, are pulled down through the two parts, broaching 35 splines in the ID of the hub.

5 As skid plate rises, unseating the parts, hydraulic plunger ejects the parts down inclined chute.

ASK FOR CATALOG 450

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

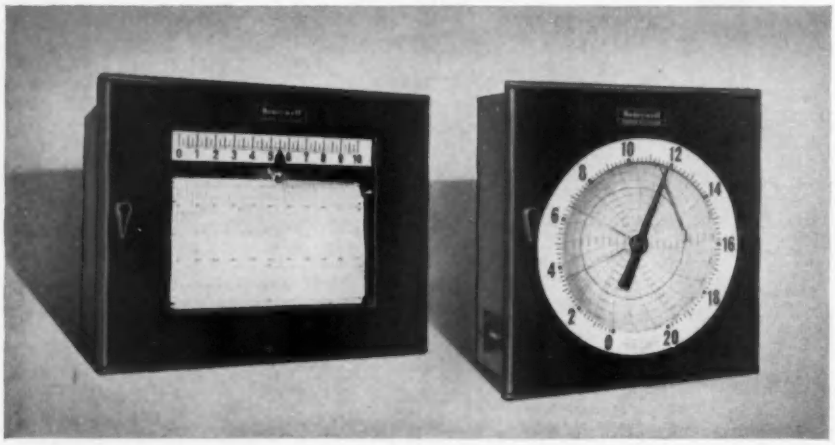
SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

• *for accuracy, versatility, price*

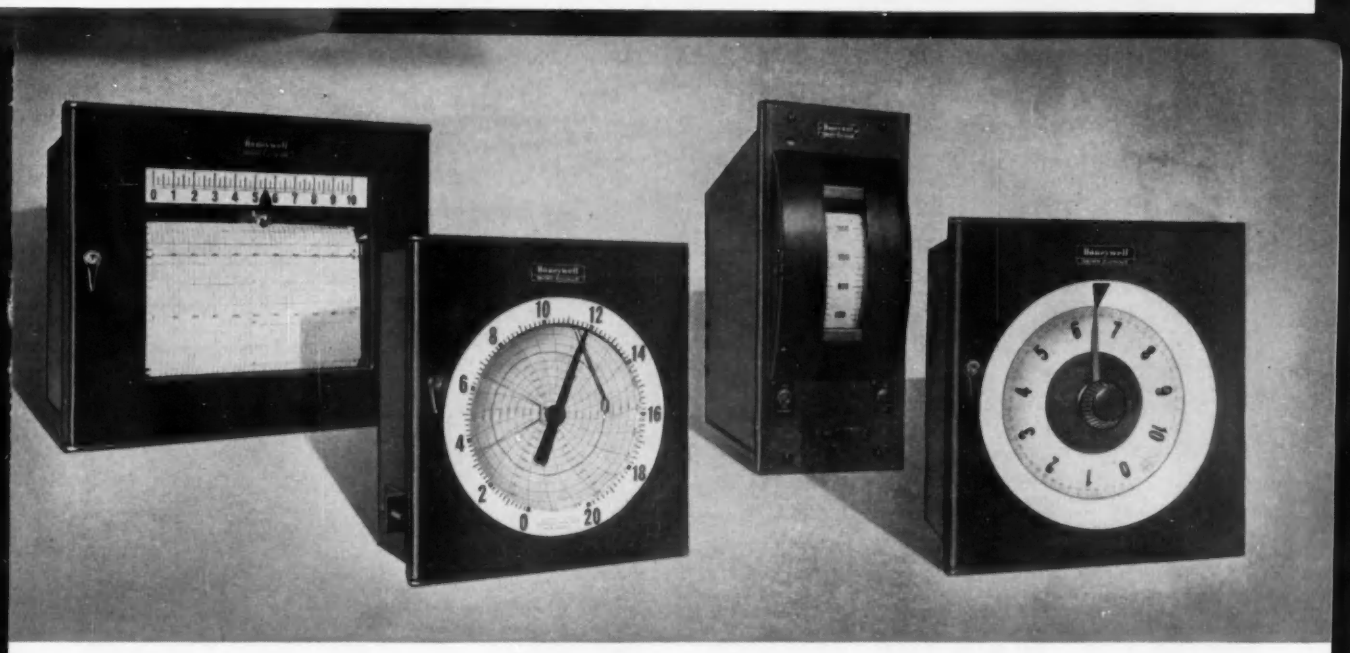
The Precision Class 15 Line of *ElectroniK* instruments has calibrated accuracy within ±.25% of scale span. Models include strip and circular chart recorders, Precision Indicators, circular scale indicating controllers, Vertical Scale Precision Indicator. Electric and pneumatic control from simplest to most complex types. Multi-point monitoring or recording of 2 to 400 separate inputs.

...Let your application decide



The Special Class 14 Line of *ElectroniK* instruments is calibrated to an accuracy of ±.5% of scale span . . . priced lower than the Precision line. Includes strip chart and circular chart recorders and recording controllers, also circular scale indicating controllers. Electric control of the contact, time-proportioning or position-proportioning type is available.

Millivoltmeter Instruments give dependable and accurate service, at low cost. High-resistance galvanometer circuit minimizes effects of varying length of extension wires. Plug-in unit design speeds servicing. *Pyr-O-Vane* controllers, in either horizontal or vertical case, give snap-action electronic vane control or pulse-type time-proportioning control.



which Honeywell instrument

fits your needs

GOT a temperature measurement or control job to handle? There's no need to "shop around." For from *one* source—Honeywell—you can be sure of getting exactly the right instrument to fit your needs.

This is the time-saving—and money-saving—way to choose instruments. You can choose from the most complete, most diversified line of pyrometric instruments on the market. Your selection can hit the application right on the button—giving you the performance you need at the price that fits your budget.

For the peak in precision and versatility, there's the "Precision" *ElectroniK* line. This is the pioneer "continuous balance" electronic instrument that thousands of plants and laboratories have used for many years. It's available in eleven basic models, and can provide automatic control action from the simplest to the most advanced types.

For less exacting applications, a new series of instruments—the "Special" *ElectroniK* line—is now available. They provide many of the forms of automatic control you can get with the "Precision" line. And they cost less . . . bringing *ElectroniK* performance within the reach of even wider areas of application.

For simplified indicating control, Honeywell offers a line of economical millivoltmeter instruments . . . *Pyr-O-Vane* controllers, with a variety of electric control forms . . . and *Protect-O-Vane* controllers for excess temperature safety cut-off.

Your local Honeywell engineer will be glad to help you determine which type of instrument best fits the needs of your own application.

Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

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MINNEAPOLIS **Honeywell**

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Large diameter coils leaving the temper mill at our Indiana Harbor Works, East Chicago, Ind.

The Big Coil Lineup

Such a lineup of big coils is an everyday sight in our cold reduced sheet mill. With complete integration of steel production from ore mines to shipping platform and with modern manufacturing facilities, we have unusual flexibility to meet any requirements on cold rolled sheets and strip. Quality control and physical specifications are no problem.

If your operation calls for cold rolled products of close uniformity and unvarying high quality, we would like to talk to you. Telephone the Youngstown District Sales Office near you or write the home office. The earlier we can discuss your requirements, the better we may be able to serve you in the coming months.

Youngstown COLD ROLLED SHEETS AND STRIP

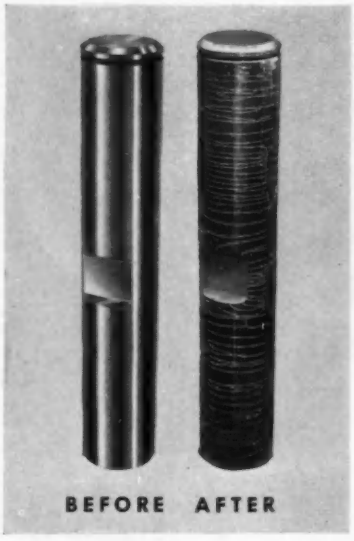
THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

Case Studies: TESTING METHODS

Stresscoat is a Magnaflux developed brittle lacquer coating for testing and measuring stresses in working parts and designs. Stress analysis is providing new ways to reduce the cost and weight of products to make them stronger, better and cheaper.



Inspection with fluorescent Magnaglo under black light reveals cracks as glowing danger signals impossible to overlook. Magnaglo increases the speed of inspection and makes it easy to spot and identify defects in keyways, threads and other hard to see places.

"GOOD TURN" INSURANCE pays off for the Todd Shipyards Corp., Brooklyn, N. Y. A portable Magnaflux unit is used to inspect for cracks in keyed taper of an 18" propellor shaft of one of the giant ocean-going vessels.

Extra Savings in Both Manufacturing and Preventive Maintenance Inspection

M methods pay "extra" dividends when used to inspect the products you make. These testing methods help pinpoint early defects in forgings, weldments, castings, bar steel and other component parts in the "rough" or finished state. It enables you to take corrective steps to eliminate their cause in the production process. You save the time, money and materials usually lost by processing defective parts and excessive scrap. By clearly showing the extent and seriousness of defects, M methods provide added benefits from salvage operations.

A "safety" bonus can mean more than dollar savings in a preventive maintenance inspection program. Early detection of fatigue cracks in a crane hook can prevent an accident which could cost lives as well as money. Magnaflux offers many complete, easy, quick, portable methods for "in plant" or "in the field" inspection of machinery and equipment.

Consider for a moment, the many ways M test methods can help you save "extra" in your present operations. Consult your Magnaflux engineer for specific information and examples of how M can help you produce better for less!

"Conveyorized" Magnaflux inspection is engineered for jet engine production line. Jet engine vanes are inspected at the rate of 5,000 or more a day. First step is magnetizing vanes. Conveyor moves vanes into inspection booth (above) where inspector watches for any accumulation of magnetic particles indicating longitudinal defects. After passing through a second ferro-magnetic bath and longitudinal magnetic field, vanes are inspected for transverse defects. Then they move automatically through a de-magnetizer.

Write for complete details concerning any of the above case studies, (excerpts from MAGNAFACTS), or ask for our new booklet on Lower Manufacturing Costs.

Take Your Inspection Problems to the House of Answers . . .

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SKF® Has Them All

If you want to be *sure* you are putting the right bearing in the right place in your product, check with SKF—the *one* bearing manufacturer selling all four major types of anti-friction bearings. From this single source, you quickly and easily get unbiased advice based on the broadest experience in the anti-friction field. **SKF INDUSTRIES, INC.,** PHILADELPHIA 32, PA.

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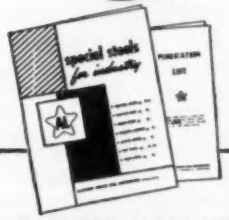
SKF

Ball Bearings Cylindrical Roller Bearings
Spherical Roller Bearings Tyson Tapered Roller Bearings

Bright good looks that **WON'T** *wear off ... value that* **CAN'T** *wear out!*



WRITE TODAY

For These Publications

1. SPECIAL STEELS FOR INDUSTRY . . . 16 pages of essential data on the proper selection and application of principal AL special alloy products: stainless, tool and electrical steels and sintered carbides.

2. PUBLICATION LIST . . . a complete listing of all AL publications, both technical and non-technical (over 100 in all), with a handy order form for your convenience.

ADDRESS DEPT. AI-76

Stainless steel brightwork (ask about it on the car *you* buy!) has much more than surface attractiveness. It has built-in, *timeless* beauty. Beauty that goes all the way through—doesn't scratch off or rust off. Beauty that lasts—outlives the car itself. And beauty that's practical . . . requires no weary polishing, just ordinary washing.

In fact, *wherever* it's used, AL Stainless delivers something extra in good looks, strength, service life and resistance to rust and wear. Even where its first cost is higher (and that's not always the case) stainless steel usually costs much less in the end, because it lasts so much longer than other materials.

AL Stainless Steel has given thousands of products a competitive edge: all sorts of products, from safety pins to railroad trains. Maybe there's a place in *your* business where it can boost sales appeal or reduce costs. Let's help you look. ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.***

Make it BETTER-and LONGER LASTING-with

AL Stainless Steel

AL ALLEGHENY LUDLUM ®

Warehouse stocks carried by all Ryerson Steel plants WAD 4933 D

Index to Advertisers

This Advertisers' Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Five ways to combat the steel shortage

As a steel distributor we, too, are greatly affected by the current shortage of plates and structurals. We have noticed, however, that those steel consumers who do the following five things seldom fail to get their share of available steel.

1. USE WAREHOUSE STOCKS

Put the legitimate warehouses (steel distributors) in your area to work on your problem. They are close to mill sources—it is their business to have up-to-date information on steel supply.

2. CONSIDER SUBSTITUTES

Give these distributors an opportunity to offer you substitute sizes and grades. Most warehouses still have many tons of steel in stock in a wide variety of grades and sizes. The answer to your problem may be easier than you think.

3. USE THE BEST SOURCES

Divide your purchases of steel from warehouses among several legitimate concerns. Be sure at least one of these concerns is a large, national warehouse that can supply you with stock from other branches.

4. AVOID THE GREY MARKET

Stay out of the grey market if you possibly can. Every time you purchase steel at higher than market prices, you increase the incentive for sharp operators to divert steel from the normal channels of distribution.

5. MAKE A LIST

Keep your warehouse sources completely and currently informed of what you need. Don't just tell them you need "anything" in beams and plates—give them an exact list of the grades and sizes that you use and keep it up to date. This means extra work for you, but it can very well pay off to your advantage, for if your steel distributor knows exactly what you need, he will pick it up wherever and whenever he finds it available.

Here at U. S. Steel Supply, we stand ready to put a coast-to-coast and border-to-border steel service at your disposal. Call us to help you combat the steel shortage.

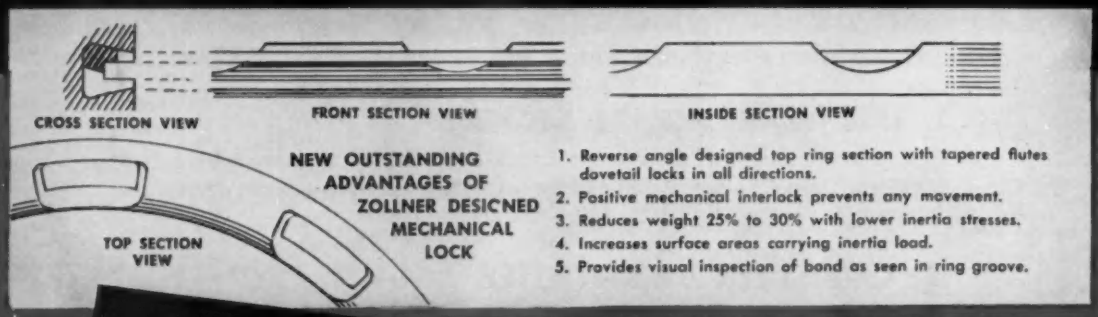
U.S. STEEL SUPPLY
DIVISION

General Offices: **208 So. La Salle St., Chicago 4, Ill.** **Warehouses and Sales Offices Coast to Coast**

UNITED STATES STEEL

BOND-O-LOC* PISTONS

WITH "NI-RESIST" IRON TOP RING SECTION



1. Reverse angle designed top ring section with tapered flutes dovetail locks in all directions.
2. Positive mechanical interlock prevents any movement.
3. Reduces weight 25% to 30% with lower inertia stresses.
4. Increases surface areas carrying inertia load.
5. Provides visual inspection of bond as seen in ring groove.

Double Bonded

METALLURGICALLY Al-Fin Bond

MECHANICALLY Zollner Lock

STOPS!

RING GROOVE WEAR IN HEAVY DUTY SERVICE

"Sensational mileage" is the unanimous report of heavy duty engine builders and transport operators using Zollner "Bond-O-Loc" Pistons. Another great development by Zollner engineers, this super-mileage piston has a "Ni-resist" top ring groove section *permanently* incorporated with the *double* bond of *both* Al-Fin metallurgic *and* the exclusive Zollner mechanical lock. Separation failure is impossible. Ring groove wear problems are eliminated, blow-by prevented, oil consumption minimized, mileage to overhauls greatly increased. We suggest an immediate test of these sensational advantages for your engine.

Licensed under Patents 2,396,730; 2,455,457; 2,550,879

*T. M. Reg. Pat. App. For

ADVANCED ENGINEERING

PRECISION PRODUCTION

COOPERATION with Engine Builders

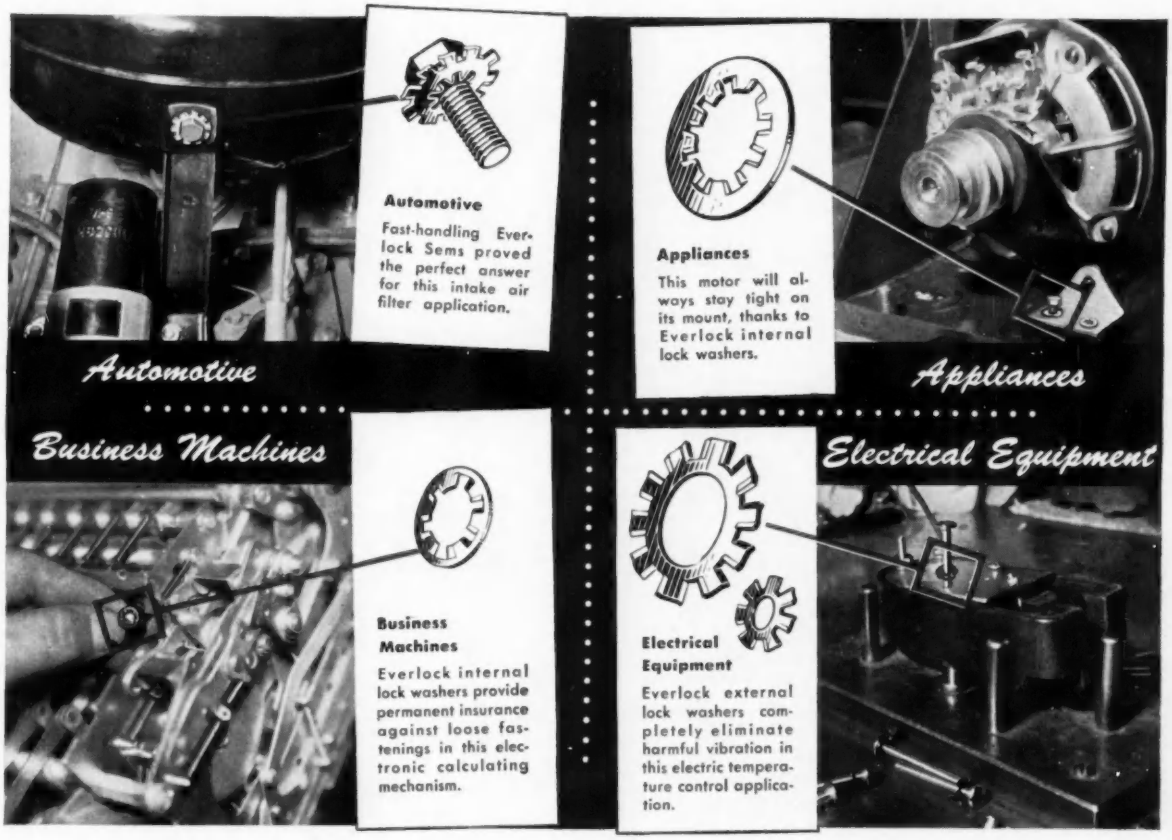
ZOLLNER PISTONS

THE ORIGINAL EQUIPMENT PISTONS

ZOLLNER

ZOLLNER · Fort Wayne, Indiana

lick loose fastenings...FOR GOOD!



with low-cost *Everlock* lock fasteners

Loose fastenings mean lost business . . . leave you wide open for costly rejections and customer complaints. Yet loose fastenings are probably your easiest-to-solve problem. Simply use Everlock lock fasteners. Vibration, constant jarring, impact—all only serve to *tighten* Everlock's bulldog bite.

Whatever your product, however it's assembled—don't overlook Everlock. Stock sizes and types, or special designs lick *your* fastening problems *for good.*

Another AMF Product

Everlock

INDUSTRIAL FASTENERS

FREE SAMPLE KIT

Put Everlock lock fasteners to the test on your own products. For your free sample kit and your copy of the brand new Everlock catalog, mail this coupon.

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Please send me:

☐ New Everlock Catalog.

☐ Free sample kit of Everlock Fasteners.

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FACTS

about

NEW DEPARTURE

STEEL BALLS

New Departure steel balls are produced in a wide range of sizes. The thimble contains about 3,000 balls one millimeter in diameter. There is enough steel in the large ball to make 156,660 of the tiny balls.

Available in any quantity to fit your specifications for grade, size and accuracy!

When industry wants steel balls of proven accuracy and dependability, it is only natural that they turn to New Departure, leading producer of ball bearings and therefore thoroughly experienced in the manufacture of precision balls. Today, New Departure provides industry with high-carbon chrome and stainless steel balls in a wide range of sizes and specifications.

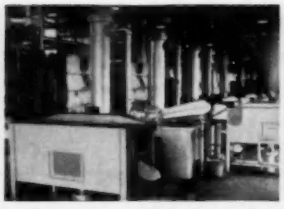
New Departure balls are produced from the finest high-carbon chrome steel. AISI Type E51100 steel, specially made for New Departure, is heat-treated to achieve the proper hardness and toughness for maximum strength and life in the finished product. Stainless steel, AISI Type 440C, used by New Departure results in balls of much improved hardness and load-carrying ability.

In addition to producing the finest steel balls available, New Departure will fill volume orders for balls of special materials such as high-nickel or cobalt-base alloys, tool steel and others.

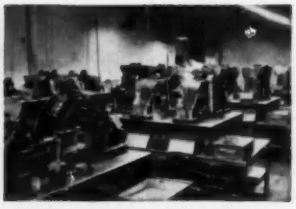
NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

Steel ball wire is drawn through dies to assure uniform diameter and roundness.

Precise control of grain flow is obtained with these Ball Heading Machines.

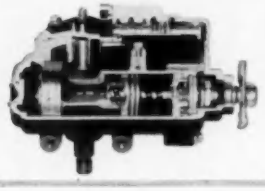


Balls are heat-treated, quenched in oil or water, then tempered in electric furnaces.



These gauges sort balls into lots according to required diameter limits.

Applications range from power steering to pencils



The unique advantages of New Departure steel balls are utilized in many applications ranging from heavy-duty bearings to the new liquid lead pencil. To accommodate these applications, New Departure steel balls are offered in sizes ranging from .025 inch to 1⅞ inches in diameter.